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БЪЛГАРСКИЯТ ПРИНОС В СВЕТОВНАТА НАУКА И ОСНОВНИ КРИТЕРИИ ЗА ОЦЕНКА НА ПОСТИЖЕНИЯТА НА УЧЕНИТЕ[1)]

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Резюме. Тази статия обсъжда състоянието и новите развития в световната наука. Преходът от 'нормалната наука' (Kuhn) към 'пост-нормалната наука' (Funtowicz & Ravetz) е коментиран. Процесите на интеграция в науката, масовото висше образование и неговото макдоналдизиране също са разгледани. Разликата между 'науката' и 'сурогатната наука' е изяснена. Съществуването на маргинални литературни източници като атрибути на сурогатната наука е дискутирано. Тази широка панорама на развитието на съременната наука дава възможност за обективна оценка на участието на българските учени в научните процеси. Изброени са някои от най-съществените и дълговечни научни открития, направени от българи.

Преценката на реалния принос на българските учени от миналото и сега в световната наука е сложна задача. Решението на тази задача предполага наличието на система за персонална оценка на научните постижения на всеки участник в световния научен процес. За да се избегнат недоразуменията е нужна ясна дефиниция на това какво е наука и е нужен анализ на съвременното състояние на световната наука и на новите тенденции в нейното развитие.

Състояние и проблеми в развитието на световната наука

Нормалната наука и международните стандарти за научна дейност

Науката е специфична човешка дейност на събиране и систематизиране на факти от неживата и живата природа и обществото, създаване на методи за тяхното получаване и изграждане на теории за тяхното обяснение. Към това се добавя науката за образованието, в която се търсят оптималните пътища за усвояване на научните резултати в процеса на обучението, без което възпроизводството на научните кадри би било немислимо. Чрез историята и философията на науката науката изучава себе си като търси законите, по които се развива научното дирене и се съществява световния научен процес. Наука е и научната и университетската политика и управление, защото на основата на тази специфична научна област се създават и развиват оптималните

организационни структури, чрез които се реализира световната наука. Следователно науката е уникален продукт на човешката цивилизация и няма национален характер, въпреки че национални теми могат да бъдат обект на научен анализ.

В тялото на науката се вграждат единствено *новите* научни резултати. Науката се занимава само с *възпроизводимите* факти – факти, които могат да бъдат наблюдавани многократно и навсякъде. *Единичните факти* не са на полето на науката – най-често те са на полето на *псевдонауката*, защото тяхната достоверност не подлежи на обективна проверка, което дава път на цяла кохорта мошеници и дилетанти, търсещи личностна изява или най-често парична изгода от непосветената обща публика. Известно е, че броят на носителите на псевдонауката се увеличава значително в условията на социални катаклизми и стопански хаос.

Доказателствеността е основен белег на науката. „Мъдростта и непорочността на ума изискват въздържане от съждения, които не могат да бъдат доказателно обосновани. Пролуката между отвлечените разсъждения и несъмненото знание, макар и мислима, би трябвало да се доведе до затваряне" (Lakatos, 1970). В този смисъл полето на науката няма нищо общо с полето на вярата (религиите) и, следователно, противопоставянето на науката и религията, основен инструмент на атеизма, не е научен подход. Светът на религиите се изгражда аксиоматично и основните представи в този свят не се нуждаят от доказателство – те се приемат безусловно и човек е готов на това, защото вярата го дарява с морал. Моралът са правила за поведение в обществото и спазването на тези правила осигурява комфорт, както на отделния индивид, така и на обществото в неговата цялост.

Има основополагащи научни резултати – *парадигми,* които имат две особености – *дълговечност*, в условията на остра конкуренция на

научните идеи, и *отвореност*, възможност за намиране в тях и чрез тях на нови научни резултати – това развитие на науката Kuhn (1959) определя като *нормална наука.*

Новите научни резултати трябва да бъдат предложени на научната общност за признаване и оценка и това става чрез публикуването им. Писменото слово трябва да търси широката публичност. Това става чрез системата на научните списания, които маркират развитието на световния научен процес. Системата на научните списания е изградена в две нива. Първото ниво включва *първичните научни списания*, някои от които търсят тясно специализираната научна аудитория, но между научните списания има и такива с по-общ профил, ангажиращ не само чисто научен, но понякога дори обществен интерес. Това първо ниво е включено в едно второ ниво на *вторични литературни източници* и двете нива заедно формират *световната система за рефериране, индексиране и оценяване.*

Публикуването на научните резултати в световната научна периодика цели: 1) създаване, обмен и разпространение на академичното знание; 2) градиране на научните изследвания според значимостта на получените научни резултати; 3) с научните публикации се осъществява промоцията и възпроизвеждането на научните кадри. Публикуването на научните резултати в първичните научни списания още не е заявка на автора за оригинален научен принос. Тази заявка се прави, когато съответният труд се индексира и реферира във вторичните литературни източници. Това действие има характера на атестат за качество и достоверност на това, което е публикувано някъде. Именно чрез системата на вторичните литературни източници се създават условия за най-широка публичност на авторовите претенции и за максимално намаляване на *времето на отзвук, t_1* (response time) – това е времето, за което една публикация получава своя първи цитат. Очевидно стойността

на t_1 маркира моментът, когато една публикация променя своя статут – от *незабелязана* и *неизползвана*, тя става *използвана* и *оценена*.

Научни списания, които не са включени в системата за рефериране, индексиране и оценяване се преценяват като *маргинални* (Dunleavy, 2003) и публикуването в тях не се препоръчва, защото се смята, че тези издания имат много тясна или почти никаква читателска аудитория и при тях няма сигурни гаранции, че това, което е публикувано, е било предварително подлагано на внимателна оценка на анонимни, независими и високо квалифицирани експерти (peer review).

Двустепенната структура на световната система за рефериране, индексиране и оценяване гарантира макроустойчивост на науката в нейната цялост. Без това устройство науката бързо може да стане жертва на разпадни процеси и да загуби своя интегритет (Toshev, 2008). Затова тези нации, които имат силно представителство в световната система за рефериране, индексиране и оценяване, са в центъра на световния научен процес – те в голяма степен определят насоките и бързината на научния прогрес; всички останали нации без солидно представителство в световната система за рефериране, индексиране и оциняване са с периферна роля в науката (Shils, 1975). Второто ниво на световната система за рефериране, индексиране и оценяване съдържа около 75 000 научни списания от всички научни области. Тези списания са попаднали там след строга инспекция по различни научни показатели. Всяко научно списание е задължено да обяви на видно място принадлежността си към едни или други вторични литературни източници. Добре е тези списъци да бъдат по-дълги, а представените в тях вторични литератулни издания – по-авторитетни.

Пост-нормалната наука и нейните особености

Още на този ранен етап на настоящия анализ може да се стигне до заключението, че българските учени от миналото и сега нямат особен принос в изграждането на парадигмите на науката, но имат съществено участие и важни постижения в развитието на *нормалната наука*, която по общо разбиране се дели на *природни науки* (science), *обществени науки* (social science) и *хуманитарни науки и изкуства* (art and humanities) като границите между тези основни научни области не са категорично очертани. Световната наука, обаче, вече не е на полето на нормалната наука, а има ново, появило се в последните десетилетия на XX век, развитие, означавано като *пост-нормална наука* (Funtowicz & Ravetz, 1990; 1993). При Kuhn (1959) научният процес се разглежда като „решаване на кръстословица" – нормалната наука се развива успешно, когато истинността на фактите е установена и е намерено тяхното точно място в „кръстословицата." За *пост-нормалната наука* това вече не е достатъчно – важно е „качеството" на новите факти (Turnpenny et al., 2011), т.е. дали тези факти нямат да бъдат източник на някакви вредни последствия за природата и обществото, иначе казано нужна е оценка на риска, който може да е присъщ на новите идеи или технологии. Така пост-нормалната наука се развива като интерфейс между наука, политика и общество (science-policy-society interface) (Petersen et al., 2011), което поражда и нови нормативни форми и организационни структури. В пост-нормалната наука се появиха стратегиите за развитие на науката, чрез който държавата заявява, че защитава обществения интерес. Така възникна и проектното финансиране на научната дейност, основано върху научни приоритети, също определени от политически органи пак в името на обществения интерес (за проектното финансиране на научната дейност в България вж. Toshev (2011)). В съдържателен план няколко основни белези на пост-нормалната наука могат да бъдат отбелязани.

Опазването на околната среда (environmental studies) и устойчивото развитие (несполучлив български превод на sustainable development) са очевидни атрибути на пост-нормалната наука: устойчивото развитие не е научен подход, а по-скоро морален императив, който обикновено се определя като „развитие, което отговаря на нуждите на сегашните поколения, без компрометиране на възможността на бъдещите генерации за посрещане на техните нужди" (World Commission on Environment and Development, 1987). Климатичните промени, породени от глобалното затопляне, изчерпването на световните енергийни източници, бедността и недохранването на големи слоеве от населението на света и свързаните с тях уродливи обществени реакции, между които е световният тероризъм, породиха нови научни развития, например генно-модифицираните храни и нанотехнологиите, чийто специфични аспекти на пост-нормалната наука – етични, правни, философски и образователни днес са обект на интензивни коментари.

Малките копират в действията си големите – така е и на полето на науката. Затова несъмнено българските учени имат участие и в развитието на пост-нормалната наука, по-скоро имитационно, отколкото съдържателно, защото едва ли горните, очертани съвсем бегло, постановки, тук са осъзнати и познати в дълбочина от широки научни кръгове.

Интеграционните процеси в науката

Двадесетият век бе век на диференциация на науките, което позволи получаването на голям брой нови научни резултати и разширяването на влиянието на науката сред обществото. В същото време този век се характеризира с безпрецедентна жестокост и безсърдечие, породени от неконтролираното използване на науката в ущърб на човечеството. Не е изключено вътрешните механизми за

самосъхранение на човешката цивилизация да предизвикват замяна на диференциацията на знанието с неговата интеграция, при което научните продукти стават достояние на големи и разнородни научни общности, което намалява вероятността за засекретяването им и неправомерното им използване. От друга страна с развитието на науката обект на изследване стават все по-сложни системи и процеси, така че получаването на новите научни резултати изисква все по-сложен инструментариум, включващ интердисциплинарни и мултидсциплинални методи и подходи. Вътрешната и външната история на науката (Lakatos, 1972) дават доказателства за цикличност на процесите на диференциация и интеграция в научното развитие. Очевидно новият двадесет и първи век се очертава като век на интегрираното научно знание.

Това развитие на съвременната наука е сериозно предизвикателство за българската научна общност. Интегрираното научно знание не е било част от предварителната подготовка на повечето от съвременните български учени, защото в един дълъг период от време висшето образование в България е изграждано върху модела на тесните специализации и квалификации – копие на съветския образователно-научен модел (Dimitrov & Toshev, 2001). Въпреки че с Болонската декларация (Тошев, 2001) и у нас моделът на тесните специализации и квалификации бе заменен с модела на широкопрофилната подготовка от университетски тип, а допълнителната специализация бе прехвърлена във втория цикъл на висшето образование, особено в последните години недържимото увеличаване на броя на програмите за образователно-квалификационната степен „бакалавър" продължава, при което лесно се вижда, че много от предлаганите програми са тясно специализирани.

Проблемът за интеграцията в науката у нас има и друг аспект. Българското научно пространство в много свои части е парцелирано, като неговите части често са ограничени с трудно пробиваеми стени –

тези парцели някои наричат „научни школи“, създадени около водещи научни авторитети. Научните школи, обаче, не са атрибут дори на науката от втората половина на двадесетия век. Изобщо държавата трябва да предприеме нужните действия, за да може интеграното знание реално да стане част от подготовката на бъдещите изследователи.

Масовизация на висшето образование и научната дейност

Има поне две явления в световното висше образование, които съществено засягат и България, но които все още чакат своя задълбочен анализ: масовизацията на висшето образование (Trow, 1973) и макдоналдизацията на висшето образование (Тошев, 2002). При второто явление по формални белези университетът се оприличава на стопанска организация и образованието се разглежда не като обществено благо, а образователен продукт, който трябва добре да се продаде. В изграждането на новото европейско образователно пространство на основата на Болонската декларация този подход се отхвърля категорично: „образованието не е стока – университетът на е супермаркет – студентът не е клиент“ (Тошев, 2001).

На пръв поглед масовизацията на висшето образование е явление с положителен знак, защото отваря вратата на университета за по-широки слоеве от населението на страната. Отрицателният ефект на това световно явление, обаче, е много съществен. Монолитните в миналото „фази“ на студентите и преподавателите в масовото висше образование се диспергират на фаза на студентите и фаза на преподавателите и фаза на маргиналните студенти и фаза на маргиналните преподаватели. В последните две фази влизат хора, които нямат качествата да бъдат нито студенти, нито преподаватели. И тогава в интерфейса между фазите на маргиналните студенти и маргиналните преподаватели избуява уродливото явление на корупцията във висшето образование. Има и

втори особено вреден ефект – с масовизацията на висшето образование се увеличава полето на сурогатната наука за сметка на полето на истинската наука.

Сурогатната наука

От изложението по-горе става ясно, че истинската наука е насочена „навън" – тя търси широката публичност на новите научни резултати. Сурогатната наука е насочена „навътре" – тук също се публикува, но в маргинални издания, които не са включени в световната система за рефериране, индексиране и оценяване. Такива издания не осигуряват публичност на претенциите на авторите, не гарантират достоверност и качество на това, което публикуват. Такива публикации по правило не са били обект на оценка от анонимни и независими рецензенти. Такива публикации обикновено са познати на малък кръг хора. Тези публикации често се използват единствено в кариерното израстване на техните автори. Тук не става дума само за журнални публикации. В тази категория обикновено са и публикациите в сборници на различни конференции. В България сега се провеждат голям брой научни конференции с международно участие, които се различават от провежданите в света научни конференции, играещи ролята на своеобразни панаири на науката, където се предлагат нови изследователски техники и нова работна ръка – бъдещи докторанти или специалисти на временни позиции в научните лаборатории (Тошев, 2003). Повечето от българските научни конференции нямат такова предназначение – чрез тях се публикуват научни трудове, които рядко имат шанс да се появят в немаргиналната научна периодика. В сурогатната наука се издават и книги, чиито автори наричат „монографии". В някои научни области наличието на монография е условие за хабилитация. Затова броят на издаваните в България

монографии е много голям. Докато в света тече процес на концентрация в научното книгоиздаване, при който прочути научни издателства стават част от огромни научни формации като Elsevier, Springer, Taylor & Francis с др, у нас „монографиите" се издават от най-различни издателства и печатници, в чийто профил не влиза такава специализирана дейност с научни редакции и борд на квалифицирани рецензенти. Затова съмнението за компилативния характер на такива съчинения, с подозрението, че при тях е използван метода „copy-paste", не е без основание.

Сурогатните учени са слаби учени. Слабите учени често са мнозинство в една научна организация. Тогава „демокрацията" е инструмент за тяхната консолидация – така се появява изборността на ръководители от всякаква степен „отдолу-нагоре". Това е изключително порочна практика, получила повсеместно приложение в България. Чрез нея се спъва нормалният научен процес, защото науката е арена на състезанието, където само най-силните имат качеството да осигурят възходящото научно развитие.

Сурогатна наука има навсякъде по света. Сурогатната наука имитира истинската наука. Затова сурогатните структури – продукт на масовизацията на висшето образование, създават собствени издателства, където всеки може да издаде книга срещу заплащане, създават свои журнали, често от групата на open access journals, където се заявява peer-review, но се публикува срещу заплащане. В полето на висшето образование подобни институции, познати в Америка главно като "diploma mills', създават дори свои акредитационни агенции, за да заблудят непосветената публика. Други международни структури печелят от човешката суета като издават биографични сборници с претенциозни заглавия, където са поместени биографични бележки, подготвени не от независими експерти, а от хората, за които тези

бележки се отнасят. У нас има хора, които съобщават с гордост на общата публика, че техните имена са се появили например в изданията на Американския биографичен институт или пък са „избрани" за членове на Ню Йоркската академия на науките.

Ясно е, че основен белег на сурогатната наука е нейната неразпознаваемост. Имената на сурогатните учени не се появяват например в авторитетните електронни вторични научни регистри като Web of Science или SCOPUS, които са част от световната система за рефериране, индексиране и оценяване. В някои страни, в частност и в България, освен масовизацията на висшето образование има и втора причина за появата на „бели полета" в световното регистриране на научната дейност. Става дума за страни, които в условията на блоковото разделение на науката по време на Студената война между световните колоси – САЩ и СССР, са останали вън от световния научен поток.

Дълг на държавата е да установи колко голямо е полето на сурогатната наука в България и да предприеме мерки за свиване на това поле и разширяване на полето на истинската наука. Едва след това могат да се правят реални краткосрочни или дългосрочни прогнози и стратегии за развитието на науката в България. Рецептурата за това е съвсем проста – пълно игнориране на маргиналната научна литература в оценъчните процедури, основаването на тези процедури върху малък брой индикатори, отнасящи се само до същинските белези на научната дейност (при много индикатори компенсационните механизми изравняват научните организации и това обезмисля оценките), анахронизъм и рецидив от миналото е разделянето на научните списания на „български" и „международни/чуждестранни" – вече бе казано, че делението е друго – научна периодика и маргинални издания.

Персонална оценка на научната дейност

Научната дейност е колективно дело и установяването на научната компетентност на научната организация минава през персоналната оценка на научните постижения на индивидуалните участници в научния процес. Намирането на количествен израз на такава оценка е задача, която още не е решена докрай.

Импакт фактор и импакт ранг

В българската научно-оценъчна практика, главно в областта на природните науки, от години се се прилага една неправомерна употреба на въведения в наукометрията от Garfield (1972) "импакт фактор". Рецензенти изчисляват *общ импакт фактор* на даден кандидат за научна степен или научно звание (сега академична длъжност) и дори изчисляват понякога неговият *персонален импакт фактор*. При това сумират импакт факторите на списанията, в които авторите имат публикации, като във втория случай получените числа нормират към един автор. Импакт факторът, обаче, е интензивна характеристика на съответното научно списание и не е характеристика на авторите, които публикуват в това издание.

Импакт факторът е количествена мярка за престижа на дадено научно издание, който с годините не е постоянна величина. В дадена година се броят цитатите, които са получили публикуваните в предходните две години във въпросното научно списание статии. Отношението на броя цитати към броя публикувани статии е импакт факторът на списанието за дадената година. Ежегодно тези пресмятания се правят от създадения във Филаделфия от Garfield Институт за научна информация – структура, която по-късно смени името си на Thomson Scientific и която сега се нарача Thomson Reuters. Тази формация

контролира около 10 % от представените в световната система за рефериране и индексиране и оценяване 75 000 научни списания от всички научни области. Така световната наука днес се маркира чрез Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index – Science и Conference Proceedings Citation Index – Social Science & Humanities.

Европейският аналог на Thomson Reuters е Elsevier в Холандия, а неговият електронен научен регистър е SCOPUS. Сега тази формация контролира 17 500 списания от всички научни области – отново част от списанията на световната система за рефериране, индексиране и оценяване. Престижът на тези списания също се определя според тяхната цитируемост като равнопоставен аналог на американския „импакт фактор, IF" е европейският „импакт ранг, SJR". Импакт рангът на списанията, представени в SCOPUS, се изчислява по сложна процедури, която държи сметка не само за цитируемостта на статиите на оцениваното списание, но по-голямо тегло имат цитатите, появили се във високопрестижни научни списания   (Gonzalez-Pereira et al., 2009; сравнение на IF и SJR е направено от Falagas et al. (2008)).

Разбира се импакт рангът, подобно на импакт факторът също е интензивна характеристика на научното списание, която е мярка за неговия научна репутация и не е характеристика на авторите, които публикуват в това списание. Импакт рангът все още не се познава добре в България. Обаче, фаворизирането на импакт фактора, IF и пренебрегването на импакт ранга, SJR в оценъчните процедури би било неправилно. В Европа като че ли предпочитат вече втория показател, най-малкото поради обстоятелството, че SCOPUS определя като престижни повече списания от тези, които имат този белег в Thomson Reuters. Нека да завършим този раздел с бележката, че само 8 български научни списания, всички в природонаучната област, са представени в

Thomson Reuters и имат незначителен импакт фактор, а българските научни списания с импакт ранг в SCOPUS са 21, от които 11 са в областта на медицината и само 3 не са в природонаучната сфера.

Индекс на Хирш

Индекът на Хирш, *h* е единственият наукометричен показател, който вече получи всеобщо признание и се използва при персоналната оценка на изследователите при тяхната професионална кариера и основно в системата на проектното финансиране на научната дейност. Днес всеки учен може да види своя *h*-индекс в научните бази-данни Web of Science на Thomson Reuters и SCOPUS на Elsevier. Ако между публикациите на даден автор могат да се намерят *x*=1,2,3,…публикации, всяка от която има *x* и повече цитати, тогава *h*-индексът на този учен ще се дава с числото *x* (Hirsch, 2005). Например, ако някой има *h*-индекс = 10, то това ще означава, че в масива на неговите публикации могат да се намерят 10, всяка от които има не по-малко от 10 цитата.

Индесът на Хирш не е мярка за значимостта и непреходността на научното творчество на учените. Например, ако допуснем, че един начинаещ изследовател е публикувал една работа, цитирана веднъж от друг автор, по отношение на неговия *h*-индекс = 1, той ще бъде равнопоставен с изследовател със същия *h*-индекс = 1, без оглед на това, че последната работа може и да е била цитирана многократно, което вече е белег за нейната научна значимост. Затова по презумция h-индексът се изчислява не за целокупното творчество на учения, а за новите му публикации (най-често от 1995 г. насам). Така се проверява доколко към текущия момент научната тематика на въпросния учен носи белезите на актуалност и следователно ангажира широко обществено внимание и доколко този човек може да работи в екип, притежава лидерство (leadership) и владее правилата на управление на научното

творчество. Ако тези качества са налице, тогава се очаква *h*-индексът да бъде по-голямо число. (Полезни коментари за използването на индекса на Хирш при българските условия в полето на физическите науки наскоро бяха публикувани (Вълкова et al. 2010).

Фактор на ефективност

Научното творчество е кумулативно (с натрупване). Затова изглежда естествено величина с екстензивни свойства да бъде количествена мярка за неговата ефективност. Несъмнено мярка за продуктивността на даден автор е броят на неговите публикации (*n*), но мярка за тяхната полезност ще е броят на цитатите/отзивите (*k*), които тези публикации са получили в научната литература. Тогава мярка за ефективността (*e*) на научното творчество на даден учен ще бъде произведението на двете величини (Тошев, 2004)[1]:

$$e = nk$$

Така при $e = 0$ (или $n = 0$, или $к = 0$) този автор всъщност не участва в световния научен процес и световната научна общност не го разпознава като свой член. Разбира се при факторът на ефективност расте с годините, т.е. изследователи с по-голям стаж ще имат по-голям фактор на ефективност. Затова ако трябва да се сравняват по-млади с по-възрастни изследователи, числото *e* може да се нормира спрямо времето на научната кариера t: $e_0 = e/t$. При отчитане на броя на публикациите *n* би могло да се държи сметка за броя на съавторите (*a*), т.е. всяка статия ще се отчита не с тегло 1, а с тегло 1/*a* (Toshev, 2007).

Много съществено е, че за стойностни изследователи факторът на ефективност ще расте и когато те са преустановили научната си дейност. Това ще бъде доказателство за дълговечността на идеите и ценността на резултатите, които тези хора са получили. Така тези учени остават

членове на световната научна общност и тогава, когато вече не са между живите.

Именно от такава гледна точка е редно да се разгледа приносът на българските учени в световната наука като се посочат имената на тези българи, които след сигурната проверка на времето остават членове на световната научна общност и техните публикации продължават да бъдат интензивно цитирани в съвременната научна литература.

Несъмнено постиженията на създадената от професорите Странски (1896-1979) и Каишев (1908-2002) българска физикохимична школа по кристален растеж е между най-ярките проявления на българския научен дух (Тошев, 1997). И най-ранните публикации на Странски и Каишев продължават да се цитират в научната литература, а т.н. модел на епитаксиален растеж по Странски-Кръстанов присъства дори в заглавията на много голям брой статии във физиката и материалознанието. Това е рядък случай, когато значението на получени нови научни резултати е оценено почти веднага след публикуването им и тяхната значимост се запазва в дълъг период от време. Ето как започва една обширна статия за растежа на кристалите във вестник *Нови дни*, бр. 155 от 26 февруари 1935 г.: „В наскоро излезлия 10 том на голямата немска „Енциклопедия на естествените науки" е поместено обширно изложение върху растежа на кристалите от немския учен проф. д-р Шпангерберг. Главно място в това изложение е отредено на постиженията на нашия учен проф. д-р И. Н. Странски и неговите сътрудници (главно д-р Каишев). Изследванията на проф. д-р Странски върху зараждането и растежа на кристалите са довели до изграждането на една модерна теория на тези явления, от голямо значение за познанията ни по строежа на материята."

Подобно е положението с българската колоидхимична школа, която се свързва най-често с името на професор Алексей Шелудко

(Toshev, 2010). От данните в SCOPUS се вижда, че цитирането на негови статии продължава с нестихващ темп. Например от началото на 2011 г. една от неговите статии (Sheludko, 1967) е цитирана вече 38 пъти.

Половин век след смъртта си акад. Дончо Костов (1987-1949) продължава да бъде цитиран в научната литература – цитират се статии на Д. Костов от предвоенния период (1929, 1930, 1933, 1934, 1938, 1940 гг.), а между цитиращите източници са Molecular Breeding, Plant Cell, American Journal of Botany, Theoretical and Applied Genetics, New Phitologist, Systematic Biology, Botanical Review, International Journal of Applied Environmental Sciences, Journal of Integrative Plant Biology и др. Изобщо това е изключителен пример на научно дълголетие, контрастиращо с късия му житейски път (Дончо Костов е починал е едва 51 годишен).

Интересен пример е проф. Георги Манев (1884-1965), днес забравеният създадел на Катедрата по теоретична физика на Софийския университет. Въпреки че проф. Манев е между последните привърженици на теорията за етера във физиката, въпреки неговата критика към релативистката теория на Айнщай и писмено отразеното отрицателно мнение на Айнщайн за Манев (Замфиров, 2008), днес някои от трудовете на Манев от 1924, 1925 и 1930 гг. са обект на интензивно цитиране в авторитетни източници по астрофизика и теоретична физика, където се говори за „проблем на Манев" и „потенциал на Манев".

За да не се остане с впечатлението, че се цитрат само автори от природонаучната сфера, ето още един пример. Дмитри Шелудко (1892-1963) (бащата на проф. Шелудко) не е бил особено познат сред българската научна колегия и по времето, когато е бил между живите. SCOPUS, обаче, показва, че негови трудове от 1926 г. и по-късно по теми, които на пръв поглед са отвлечени – проблеми на украинския език, песните на минезингерите или поезията на Мистрал, привличат научно

внимание и днес и са обект на цитиране от съвременни автори в специализираната литература.

В науката има теории и резултати, които са познати с имената на техните автори. Несъмнено това е висша форма на признание на направеното от даден учен. В химията има много химични реакции, които са известни с имената на техните откриватели. Между именните в реакции в органичната химия широко известна е реакцията на Иванов (1931 г.) – взаимодействие на магнезиево-халогеннопроизводна сол на фенилоцетната киселина (реактив на Иванов) с карбонилсъдържащи съединения (Surrey, 1961).

Със сигурност има и други български учени с научно дълголетие. Всъщност те са истинската мярка за българския принос в световната наука. Със сигурност и в сегашните генерации български учени има хора, чийто научни постижения трайно ще заемат своето място в тялото на науката. Но както в миналото, така и сега има хора с мимолетно участие в научния процес и между тях са и хора, които се радват на популярност в обществото, което ги приема като учени, но световната научна общност не ги разпознава като такива. Примерите не са единични.

Буди размисъл фактът, че съдбата не винаги е била благосклонна спрямо някои от посочените по-горе учени, т.е. безметежният живот и материалното благополучие не са условия за успешна и стойностна научна дейност. През късната есен на 1944 г. по най-тежкия член 2 на „Наредбата-закон за прочистване на учителския и преподавателския състав в народните основни и средни училища, учителските институти и Университета, и висшите училища и академии"[3] професорите Странски и Манев (вторият по-рано Декан на Физико-математическия факултет, Ректор на Университета и Министър на народното просвещение) са отстранени завинаги от Университета. И докато проф. Странски просто

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не се върна в България и продължи със същия успех научната си дейност в Германия, то проф. Манев никога вече не получи възможност за научни занимания. Проф. Димитър Иванов (1893-1975), въпреки реакцията на Иванов, също по тази наредба е бил отстранен от Университета за една година. Изпълнен с драматизъм е и краткият живот на проф. Дончо Костов. Той е тръгнал от с. Локорско, завършил е Военното училище, в самия край на войната, на Дойранския фронт, подразделението на подпоручик Костов е дало жертви от газовите атаки на противника, противоречива и трудна научна кариера в Софийския университет, успешна и ползотворна работа с генетика Вавилов в СССР, връщане в България, членство в БРП (к) и накрая насилствено отказване от всички получени резултати в неговата научна област след срамната за България конференция за отричане на генетиката от април 1949 г.: „Стига по-скоро да укрепя своето здраве, аз ще положа всички усилия, щото този процес на преустройство на науката да бъде колкото се може по-скоро завършен" (Тошев, 1998).

Заключение

Този доклад не анализира българския принос в световната наука към настоящия момент и причините за това са няколко. Най-напред такава информация е предлагана на публиката многократно. За Българската академия на науките резултатите от научно-изследователската дейност са представени в нейния последен годишен отчет.[4] Данните в този отчет общо взето са оптимистични, но има числени данни, които са обезпокоителни. Например, БАН твърди, че през 2010 г. са публикувани общо 10 295 научни труда. Лесно е, обаче, да се види, че делът на маргиналната литература, в смисъла на това, което бе казано по-горе, е значителен – 23 % са трудовете в български тематични сборници и сборници от конференции, 24 % са статиите в български

списания и периодични издания, 9 % са учебните и научно-популярните публикации или 56 % от научната продукция очевидно не е била отразена в световната система за рефериране, индексиране и оценяване. А вече бе казано, че сега в България може да се публикува всичко и всеки публикуван труд може да претендира за научност (имаме и скорошна книга с предложение за конструиране на вечен двигател (Иванов, 2007). България е бедна страна и е неоправдано да се пилеят средства за дейности в сурогатната наука.   Частични и разбира се непълни данни за българското участие в световната наука могат да се извлекат от научните регистри Web of Science или SCOPUS, но тогава българското участие ще трябва да се прецени като скромно на фона на колосите в науката – САЩ и Япония и новите сили Китай и някои други страни, между които е дори съседна Турция. Затова в този доклад се акцентира върху непреходните ценности в науката и в тази плоскост българските учени са имали и ще имат съществени приноси, което трябва да ни изпълва с гордост, още повече защото, за разлика от повечето европейски страни, България късно излиза на световната научна сцена.

Дискусиите, които Съюзът на учените в България организира, могат да изиграят важна роля: 1) за очакване е отговорните фактори да разберат в дърбочина проблемите, които тревожат българската научна общност и да предприемат адекватните действия за истинска реформа на българската образователно-научна система на основата на сигурни, научно-обосновани и общоприети ориентири, без хаотични стъпки и лъжливи симулации и 2) тези дискусии са път към консолидация на нашата научна област. А трябва да признаем, че нашата научна общност в момента е силно разколебана, деморализирана и деинтегрирана. Пишейки за цикличността в научния процес, в мен остана тягостното чувство, че цикличност има и в състоянията на българската научна система, което май следва от известната теорема на Поанкаре – всяко

състояние на една система се повтаря с произволна точност многократно и по-често, когато системата е по-малка. България има относително малка научна общност. Ето една преценка за състоянието на българската химическа колегия към 1945 г.:[5] "… сред химиците се установиха две идеологии – демократична, носители на която бяха всички прогресивни елементи... и фашистко-авторитарна, носители на която бяха всички реакционни елементи. Между тези две групи се намираше една неоформена маса интелектуалци, която се люшкаше без компас и според вятъра на ляво и на дясно. ... Групата на носителите на фашистко-авторитарната идеология представляваше конгломерат от крайно амбициозни, кариеристични интелектуалци, лишени от всякаква идеологическа спойка, вън от техните лични амбиции." В нашите ръце е стабилизацията на нашата научна колегия – това ще рече да потърсим спойката между нас, да се почувстваме част от едно цяло, да поставим под контрол непродуктивните емоции – завистта, пренебрежението към другия, користта, страха от промяната, лицемерието... Без това каквито и пари да дойдат от държавата, дори и да се изпълнят в пълна мяра предписанията на Лисабонската стратегия, за което често говорим, успехът едва ли ще ни споходи. Можем ли да сторим всичко това?!

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2. Тази малка статия, публикувана в сп. *Наука*, бе забелязана от Garfield, когото с право преценяват като родоначалник на наукометрията: "subject: B.V. Toshev. Academic Journals and Their Impact Factor. Nauka. 14(5), 28. Dear Dr. Toshev,….If you send me an extended summary I would

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BULGARIAN CONTRIBUTION TO WORLD SCIENCE AND MAIN CRITERIA FOR ASSESSING THE ACHIEVEMENTS OF SCIENTISTS

Abstract. The status and the new developments in world science are both discussed. The transition from the 'normal science' (Kuhn) to the 'post-normal science' (Funtowicz & Ravetz) is commented. The integration processes in science, the mass higher education and its mcdonaldization are also considered. The difference between 'science' and 'surrogate science' is explained. The existence of marginal journals as an attribute of the surrogate science is discussed. Such a broad-based consideration allows a realistic assess of the contribution of Bulgarian scientists in the development of world science to be made. Some of the most important scientific achievements made by Bulgarians are listed.

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UNDESIRABLE BEHAVIORS ELEMENTARY SCHOOL CLASSROOM TEACHERS ENCOUNTER IN THE CLASSROOM AND THEIR REASONS

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Abstract. The present study aims to determine how often elementary school teachers encounter undesirable behaviors in the classroom and what their thoughts regarding possible reasons of these behaviors are. The teachers' opininons about the prevalence of these behaviors and their possible reasons were evaluated according to gender, marital status, level of class being taught, size of class being taught and it was tried to be determined if there were significant differences between variables. The measurement tool was aplied to a total of 54 teachers at 5 schools in Gölcük district of the Kocaeli province. The data collection tool is composed of three sections. The first section is for establishing teachers' personal information. In this study, as a data collection tool, a questionnaire was used. When preparing questions for the questionnaire, following the examination of resources available, the questionnaire prepared by Aksoy (1999) and used in the thesis study entitled **"**Classroom Management and Student Discipline in Elementary Schools of Ankara" and also used in the thesis study by Boyraz (2007) entitled "Discipline Problems that Candidate Teachers Servicing at Elementary Schools Encounter in the Classroom" was

employed. Although the validity and reliability of the questionnaire was tested by Aksoy (1999) and Boyraz (2007), the reliability study for the questionnaire was retested and found to be 0,9. The questionnaire include 42 items. 19 of them are related to the reasons of undesirable behaviors observed in the classroom and 23 of them are related to undesirable behaviors observed in the classroom.

Keywords: undesirable behavior, reasons, classroom management

1. Introduction

The importance of education as a social process including all the activities performed to achieve desirable modifications in the individual's behaviors, have them acquire new behaviors, and develop individual and societal abilities is gradually increasing. What is expected from education is beyond having the individual acquire information and skills but to train individuals capable of maintaining the survival and growth of society, keeping up with the rapidly changing world and making desirable changes in their environment (Varış,1998; Sadık, 2000).

Moreover, training a person with desirable qualities is an important mission of the teacher (Oral, 1997). In the heart of anyone of ours lies a memory and love of at least one teacher having deeply affected and guided us (Günay, 2005).

A major part of education that continues throughout the life of a human passes in the classroom. The classroom is a living area where the activities of education and teaching are realized (Aydın, 1998). The studies made on effective teaching have shown the importance of the classroom conditions based directly on teachers' skills of organizing and managing their classrooms (Güleç and Alkış, 2004). The classroom with its simple meaning or definition is the core center where the teaching is realized. Classrooms located under the

roof of the school can be described as the environments where students and teachers come face to face and the conditions of teaching are realized (Çakmak, 2000; Açıkgöz,1998) defines classroom atmosphere as a composition of student-student and teacher-student relationships lived in the classroom, rules to be obeyed, and psychological, social and physical factors occuring as a result of the physical conditions of the classroom (Bilgiç, 2007). One of the most important factors spoiling the positive social and psychological atmosphere in the classroom is students' preventing education and teaching in the classroom by exhibiting undesirable behaviors and, as a natural result of this, teachers' bringing to a climax. From this perspective, the management of student behaviors and the effective management of classroom atmosphere are closely related with one another. The teacher's scolding students, shouting at them, applying physical punishment or attacking their personality or values in case of only slightly negative behaviors leads to the spoiling of classroom atmosphere and the growth of fear and concern in students (Erden, 1998; cited by Sadık, 2000). Classroom management covering also the management of student behaviors at the same time determines the quality of education.

It is reducing study-related impediments before teachers and students to a minimum level, using the teaching time efficiently and ensuring students' participation in activities. It is the management of resources, people and time in the classroom (Başar, 2001; cited by Günay, 2005). The most important evidence of the success or failure in the classroom management is the behaviors exhibited by students in the classroom (Erden, 2001). A good description of behaviors which are undesirable in the classroom is important in terms of the modification of these behaviors (Aydın, 2000). Undesirable behaviors in the classroom are the ones disturbing the teacher and other students in the classroom, negatively afffecting students' relationships and communication with other students and with the teacher, hindering educational golas, plan and studies, contradicting with the teacher's expectations and classroom rules and making a fuss in the classroom (Şahin, 2005). According to Okutan (2004),

undesirable behaviors are the ones decreasing the quality of classroom management. These behaviors spoil the classroom discipline and lead time management to becaome negative. According to this definition, all behaviors hindering education-teaching in the classroom are called "undesirable or negative behaviors" (Okutan, 2004).

Considering that a lesson is usually performed with 30 to 50 students in elementary classrooms, students from different cultures and socio-economic classes and with different values, personalities, needs, events, attitudes, preferences and interests come together in the same classroom to acquire desirable behaviors. It seems rather difficult for students with so many different characteristics to come together in the same classroom and share the same environment with no problems (Türnüklü et al. 2000; cited by Karakaş, 2005). In such an environment, students' behaviors resulting from their numerous characteristics such as desires, aims, interests, leadership, appropriation, self-centeredness, complex, ambition, lower or higher level of intelligence, economic capability, etc. will definitely coincide at a point and conflicts will begin. The turning of these conflicts into undesirable behaviors will be inevitable. Removing undesirable behaviors, reducing their effects or ensuring their non-occurence with some measures is very important for the education-teaching process to become efficient (Karakaş, 2005).

Understanding behavior is necessary not only for knowing about reasons of present problems but also for predicting future undesirable behaviors. Only then will the type of the action or the strategy to be selected and the way of performing it be clear (Sadık, 2000).

Actions that teachers can use to prevent undesirable behaviors can be many in number. Among these are the ignorance of small mistakes, behaving as if not knowing about provocative actions, the establishment of eye-communication, the ability to use gestures and mimics as a deterrent factor; warning, scolding, changing one's place, having the student realize his/her mistake by using humour, shuffling, going off the lesson, assigning

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responsibility, talking with the student, depriving the student of some rights and previliges, keeping the student in the classroom (detaining), not indulging his/her desire, establishing relationship with his/her parents, making an agreement with the student, giving non-physical punishments and the methods to be carried out (Korkmaz et al., 2009).

In this study, it was aimed to investigate the frequency of undesirable, with its another name discipline-spoiling, behaviors that teachers working at elementary schools encounter and the reasons of these behaviors according to teachers. To achieve these aims of the study, answers were sought for the following questions: (1) What are the types of undesirable behaviors that teachers working at elementary schools encounter most frequently in the teaching environment? (2) What are the sources of students' undesirable behaviors according to teachers working at elementary schools? (3) What do teachers think about the prevalence of undesirable behaviors? Do these sources change according to teachers' gender, marital status, level of the class they teach and size of the class they teach? (4) Do the thoughts of teachers about the reasons of undesirable behaviors change depending on their marital status, gender, level of the class they teach and size of the class they teach?

2. Method

2.1. Sample

In this study, it was aimed to determine undesirable behaviors that teachers working at elementary schools encounter in the classroom and their thoughts about reasons of these behaviors and whether there was a significant relationship between reasons of these behaviors and variables such as teachers' gender, their marital statuses, the level the class of which they are the teacher, the number of students in their classrooms was examined. In the direction of this purpose, a total of 54 teachers working at five elementary schools in Gölcük district of the Kocaeli province were administered the measurement tool.

2.2. Data collection tool

The data collection tool is composed of three sections. The first section is for finding out some pieces of personal information about teachers. In this study, as a data collection tool, a questionnaire was used. When preparing questions for the questionnaire, following the examination of resources available, the questionnaire prepared by Aksoy (1999) and used in the thesis study entitled **"**Classroom Management and Student Discipline in Elementary Schools of Ankara" and also used in the thesis study by Boyraz (2007) entitled "Discipline Problems that Candidate Teachers Servicing at Elementary Schools Encounter in the Classroom" was employed. Although the validity and reliability of the questionnaire was tested by Aksoy (1999) and Boyraz (2007), the reliability study for the questionnaire was retested and found to be 0,9. The questionnaire include 42 items. 19 of them are related to the reasons of undesirable behaviors observed in the classroom and 23 of them are related to undesirable behaviors observed in the classroom.

3. Analysis of data

In the analysis, whether data showed normal distribution was examined with Shapiro-Wilk test. For the data not showing normal distribution, Mann-Whitney U test was used for the comparison of two groups, and Kruskal Wallis test was used for the comparison of more than two groups. The relationships between the variables were examined with the Pearson correlation coefficient. The analyses regarding the answers given to the questions composing the personal information section of the measurement tool were made with frequencies and percentage calculations.

In this study, primarily, some demographic characteristics of the classroom teachers' were given with their frequency and percentage distributions. 40 (74,1%) of the teachers participating in the study were female and 14 (25,9%) of them were male. 15 (27,8%) of the teachers were single and 39 (72,2%) of them were married. 16,7% of the classes of the teachers

participating in the study were composed of 10-24 students, 72,2% of them were composed of 25-34 students and 11,1% of them were composed of 35-44 students. 11,1% of the teachers were teaching the 1st graders, 13% of them were teaching the 2nd graders, 13% of them were teaching the 3rd graders, 13% were teaching the 4th graders, 14,8% were teaching the 5th graders, 11,1% were teaching the 6th graders, 13% were teaching the 7th graders and 11,1% were teaching the 8th graders.

Table 1. Detailed analysis of the frquency of undesirable behaviors that teachers   working in elementary schools encounter in the teaching environment

Undesirable student behaviors	a	%	b	%	c	%	d	%	e	%	X
1-Behaving rudely and disrespectfully to teacher	15	27,8	19	35,2	12	22,2	8	14,8	-	-	2,24
2-Not fulfilling the teacher's desires regarding the lesson	1	1,9	14	25,9	19	35,2	17	31,5	3	5,6	3,12
3-Coming to class late	6	11,1	27	50	17	31,5	4	7,4	-	-	2,3
4-Fighting	5	9,3	9	16,7	18	33,3	19	35,2	3	5,6	3,11
5-Assaulting verbally (Quarrelling)	5	9,3	11	20,4	22	40,7	12	22,2	4	7,4	2,98
6-Talking without permission	2	3,7	8	14,8	11	20,4	23	42,6	10	18,5	3,5
7-Talking extremely and disturbingly	3	5,6	9	16,7	30	56,6	9	16,7	3	5,6	3
8-Exhibitng behaviors to spoil the course of the lesson (For example, circulating a note secretly, laughing, whistling, performing mimics)	4	7,4	16	29,6	20	37	12	22,2	2	3,7	2,8
9-Eating or drinking during the lesson	25	46,3	17	31,5	12	22,2	-	-	-	-	1,7
10-Cheating	18	33,3	20	37	13	24,1	3	5,6	-	-	2
11-Telling lies	2	3,7	25	46,3	21	38,9	4	7,4	2	3,7	2,6
12-Using bad language	7	13	19	35,2	17	31,5	8	14,8	3	5,6	2,6

	34	63	15	27,8	5	9,3	-	-	-	-	1,4
13-Stealing	34	63	15	27,8	5	9,3	-	-	-	-	1,4
14-Not doing homework assignments	1	1,9	12	22,2	28	51,9	10	18,5	3	5,6	3
15-Wandering in the classroom without permission	10	18,5	18	33,3	19	35,2	6	11,1	1	1,9	2,4
16-Showing interest in other things during the lesson (For example, reading extracurricular books, painting/drawing pictures)	3	5,6	29	53,7	15	27,8	6	11,1	1	1,9	2,5
17-Sleeping in the lesson	42	77,8	11	20,4	1	1,9	-	-	-	-	1,2
18-Nicknaming	9	16,7	19	35,2	11	20,4	11	20,4	4	7,4	2,6
19-Teasing other students with tools such as a weapon, a knife and the like	47	87	4	7,4	3	5,6	-	-	-	-	1,1
20- Teasing the teacher with tools such as a weapon, a knife and the like	52	96,3	1	1,9	1	1,9	-	-	-	-	1
21-Giving harm to other students' belongings	10	18,5	27	50	12	22,2	4	7,4	1	1,9	2,2
22-Giving harm to the teacher's belongings	46	85,2	6	11,1	2	3,7	-	-	-	-	1,1
23- Giving harm to things belonging to the school	10	18,5	28	51,9	13	24,1	3	5,6	-	-	2,1

a- never; b- rarely; c- sometimes; d- often; e- always

According to the findings obtained from Table 1, the first three of the undesirable behaviors that the teachers encountered most frequently were, in order of prevalence, "talking without permission", "nicknaming" and "assaulting verbally". When we look at the behaviors that the teachers never encountered, we saw that "teasing the teacher with such tools as a weapon, a knife and the like", "teasing other students with such tools as a weapon, a knife and the like" and "giving harm to the teacher's belongings" were the first three.

As a result of the Mann-Whitney U test providing the answer to the question of "Is there a significant difference between the teachers' thoughts about the prevalence of undesirable behaviors and their gender?", no significant difference was found between the female teachers and the male teachers with respect to the frequency of their encountering undesirable behaviors. As a result of the correlation analyses made, it appeared that the frequency of teachers' encountering undesirable behaviors did not change according to the class level they taught.

As a result of the Kruskal Wallis analysis, it was determined that the frequency of the teachers' encountering undesirable behaviors did not change according to the size of the class they taught either. The frequencies and percentages appearing as a result of the analyses made with regard to the teachers' opininons about the reasons of undesirable behaviors are shown in the Table 2.

Table 2. Detailed analyses of the reasons of students' undesirable behaviors according to the teachers working in elementary schools

Reasons	f	%	g	%	h	%	k	%	l	%	X
1-Effect of violence shown on TV and other communication means	1	1,9	3	5,6	6	11,1	18	33,3	26	48,1	4,2
2-Crowded classes	3	5,6	11	20,4	18	33,3	16	29,6	6	11,1	3,2
3-Arrangements made in the classroom	6	11,1	12	22,2	20	37	11	20,4	5	9,3	2,9
4-Unclear rules and instructions to be obeyed in the classroom	6	11,1	18	33,3	13	24,1	11	20,4	6	11,1	2,8

5-Boring lessons	13	24,1	16	29,6	15	27,8	9	16,7	1	1,9	2,4
6 Insufficient teaching aids	8	14,8	7	13	13	24,1	17	31,5	9	16,7	3,2
7- Teaching practices not suitable for the developmental levels of students	6	11,1	8	14,8	19	35,2	15	27,8	6	11,1	3,1
8-Parents' negative attitudes and behaviors toward their children	1	1,9	2	3,7	9	16,7	19	35,2	23	42,6	4,1
9-Parents' indifference to their children's education	3	5,6	2	3,7	6	11,1	14	25,9	29	53,7	4,1
10-In-family problems	-	-	-	-	7	13	16	29,6	31	57,4	4,4
11-Effect of the developmental characteristics of the age at which students are	1	1,9	1	1,9	11	20,4	21	38,9	20	37	4
12- Cultural, economic and social differences among students	-	-	4	7,4	15	27,8	25	46,3	10	18,5	3,7
13-Giving homework assignments not attracting students' attention	2	3,7	17	31,5	17	31,5	13	24,1	5	9,3	3
14-The teacher's not knowing of discipline achieving approache	5	9,3	14	25,9	15	27,8	11	20,4	9	16,7	3

s

	f		g		h		k		l		
15-The teacher's incapability in teaching methods	11	20,4	14	25,9	8	14,8	12	22,2	9	16,7	2,8
16-The teacher's being inconsistent	6	11, 1	14	25,9	9	16,7	12	22,2	13	24,1	3,2
17-Dependency on peer group	2	3,7	7	13	13	24,1	21	38,9	11	20,4	3,5
18-Not knowing about friends well	4	7,4	7	13	22	40,7	17	31,5	4	7,4	3,1
19-Misguidance by friends	2	3,7	6	11,1	17	31,5	15	27,8	14	25,9	3,6

f- strongly disagree; g- slightly agree; h- moderately agree; k- greatlly agree; l- strongly agree

According to the findings obtained from the Table 2, the four of the reasons of undesirable bahaviors with which the teachers strongly agreed were, in order of frequency, "in-family problems", "effect of violence shown on TV and other communication means", "parents' indifference to their children's education" and "parents' negative attitudes and behaviors toward their children". The items with which the teachers strongly disagreed were "boring lessons", "the teacher's incapability in teaching methods" and "insufficiency of teaching aids".

From the findings obtained as a result of the Mann Whitney U test, it appeared that the teachers' opinions about the reasons of undesirable behaviors did not change depending on their gender.

From the findings obtained as a result of the Mann Whitney U test, it appeared that the teachers' opinions about the reasons of undesirable behaviors did not change depending on their marital statuses.

According to the findings obtained as a result of the Kruskal Wallis H test, it can be said that the teachers' opinions about the reasons of undesirable behaviors did not change depending on the size of the class they taught.

4. Conclusions and suggestion

The conclusions reached following the analyses made in accordance with the aims of the study are as follows:

1- The undesirable behaviors that the teachers encountered most frequently were ranked as folows: "Talking without permission", "nicknaming" and "assaulting verbally". The undesirable behaviors that the teachers encountered least frequently were ranked as follows: "Teasing the teacher with such tools as a weapon, a knife and the like", "teasing other students with such tools as a weapon, a knife and the like" and "giving harm to the teacher's belongings".

2- No significant difference was found between the female teachers and the male teachers with regard to the frequency of encountering with undesirable student behaviors.

3- The frequency of the teachers' encountering undesirable behaviors did not change according to the level and size of the class they taught and their marital statuses.

4- The four of the reasons of undesirable bahaviors with which the teachers strongly agreed were, in order of frequency, "in-family problems", "effect of violence shown on TV and other communication means", "parents' indifference to their children's education" and "parents' negative attitudes and behaviors toward their children". However, the items with which the teachers strongly disagreed were "boring lessons", "the teacher's incapability in teaching methods" and "insufficiency of teaching aids".

5- It was observed that the teachers' opinions about the reasons of students' undesirable behaviors did not change according to their gender, marital statuses and the size of the class they taught.

When the results obtained are considered, the following suggestions can be made to increase the quality of teaching: i) An undesirable behavior may result from many reasons. Encountering an undesirable behavior, classroom teachers should primarily be open to search for possible reasons of this behavior; ii) Classroom teachers should keep in mind that an undesirable behavior may appear due to their mistakes and open to self-criticism and take necessary precautions; iii) Classroom teachers should continuously develop themselves about classroom management and open to innovations; iv) Classroom teachers should determine the method and approach to use in classroom management when trying to prevent an undesirable behavior by taking the reason for the behavior to appear and characteristics of the student causing the behavior into consideration; vi) In the end of the study, the three of the items from among the undesirable behaviors with which the teachers strongly agreed were "In-family problems", "Parents' indifference to their children's education" and "Parents' negative attitudes and behaviors toward their children". Considering these, parents should be communicated closely and informed about necessary topics; vii) This study included the classroom teachers working at elementary schools in Gölcük district of the Kocaeli province. By expanding the scope of the study, it can be carried out in other provinces and also at secondary educational institutions.

The study can be expanded in scope by adding new variables such as socio-economic status of the environment where the school is located, socio-economic status of the student's family and the educational status of the student's family.

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THE ENVIRONMENTAL CONCERN OF NINE-GRADE STUDENTS FROM A SECONDARY PROFESSIONAL SCHOOL

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Abstract. The study analyzed the historical development of worldviews on human-environment interrelationships, different environmental attitude measuring instruments and the properties of the New Ecological Paradigm scale (NEPs). Based on the analysis, the NEP scale was considered a good and reliable attitude-measuring instrument and was employed for assessing environmental concern of students in a vocational school. A self-administered survey questionnaire was used to collect the necessary data. On the whole, students demonstrated positive attitude to the environment. They showed strong attitudes on the possibility of ecocrisis and weak attitudes on limits to population growth, better outlined tendency to ecocentrism than to anthropocentrism, and a good understanding of the delicate nature of the ecological balance. Their trust in technological advancement and in human intellectual abilities to solve ecological problems was well expressed. A

significant part of them (about one fifth) demonstrated uncertainty acting on the save side. The mean scores (4.18 for the test and 4.15 for the re-test) for NEP significantly predominated over the mean scores (3.23 for the test and 3.20 for the retest) for DSP. Results will be employed in curricula and teaching strategies improvement.

Introduction

Environmental concern is a complex concept, which has many facets because of the complex structure of the human environment and even the more complex composition of human-environment interactions. It is also a concept of culture based on many branches of science (ecology, biology, geography, physics, chemistry and geology), history, sociology, ethnology, politics, technology, etc. In a concise sense it means "advocacy for or work toward protecting the natural environment from destruction and pollution" and it is theoretically backed by the research findings "that environment rather than heredity is the primary influence on intellectual growth and cultural development."[1] Hutchins (1968) defines an ideal society as one that "develops intellectual mind". All cognitive and constructivist theories of learning value the social influence upon personality development of individuals. It is through culture that human beings understand their interaction with the environment, but culture co-evolves with evolution of concepts. Environmental concern implies "worldwide efforts to bring environmental education (EE) to the forefront of students' lives,"[2] "a belief in and active concern for the state of Earth's natural resources and for the importance and influence of environment within a society."[3,4] In ethical terms, it is "a necessity for sharing and

conservation, having a responsibility for our environment."[5] Environmental problems become known via scientific knowledge, activists' efforts and media attention, i.e. via social processes.[6] Therefore, to understand, apply and interpret the concept of environmental concern, it is important to view the successive stages of the understanding of the concept "environment" and human attitudes to it.

Conceptual framework

The understanding of the complexities of the interrelationships between the natural environment and human activity is a necessary condition for the maintenance and improvement of environmental quality. Human-environment relation started as *biological determinism*, based on Charles Darwin′s theory of natural selection (1859) and Ernst Haeckel′s[7,8] definition of ecology (1866). In his book "*Morphology of organisms*" Haeckel defined ecology as follows: "By ecology we mean the body of knowledge concerning the economy of nature – the total relations of the animal to both to its inorganic and organic environment." He established the link between physical and biological sciences and the interaction of abiotic and biotic factors of the environment (Llobera, 1998).

As research enlarged and deepened the understanding of humans, new aspects of human-environment interaction and new scientific disciplines emerged – psychological ecology, ecological economics, ecological architecture, environmental sociology, ecological geology (eco-geology), ecological geography, ecological chemistry, human ecology, etc. (Little, 1991). Biological determinism was unable to give a fully satisfying explanation of human-environment interactions as it assumed the priority of genetic constitution in shaping human behavior. Evolutionary psychology like Social Darwinism before it, served to legitimate current social formations by giving them a genetic basis. Neither was adequate the *environmental*

determinism, which sought the causes for personal, social and cultural development in the climate and the geographical conditions of a given country.

In 1970s environmental sociologists sought the reorientation of sociology toward a more holistic perspective that would conceptualize social processes within the context of the biosphere (Huber, 2002; Buttel, 2003; Wilson, 1975) and developed the concept of *social determinism*. Areas of research within environmental sociology emerging nowadays are environmental justice, global environmental change and urban environment. The Standard Social Science Model (SSSM) assumes that no part of human nature is inherited and cultural forces fix all human attributes. Social determinism cannot account for all factors of the human-environment interaction, as many phenomena within this interaction have not been enlightened yet. It cannot fully explain and take into account the unique position of humans in the ecosystem as both a part of it and a social, moral and reflective being. It cannot overcome the biological determinism and reductionism regarding nature only outside human beings, not inside them, failing to understand the interaction of biological and social evolution and underestimating the meaning and usefulness of ecological concepts (Zavestoski, 1997). Social determinism neglects the psychological and cultural aspects of human-environment interaction, the role of ecological consciousness and behavior and the differences in the consumer culture of societies. The contribution of environmental sociology is prominently visible in the study of societal-environmental interactions, placing special emphasis on studying the social factors that cause environmental problems and on efforts to solve them. It views environmental problems via social processes despite the material bases they have external to humans.

Taking into account the words of Mills (1959) that "All sociology worthy of the name is historical sociology … the historical view point leads to the comparative study of societies", it is useful to construct an evolutionary

picture of the concepts′ development within societal-environmental interrelations (Appendix).

Biology, sociology, phylosophy[9] and political sciences[10] exercise their influence on the different trends of understanding human-environment relationships and the emphasis gradually changes from biocentrism to ecocentrism (a nature centered system of values) and reflective modernization (Vernadsky, 1998, originally published 1926). The global crisis is anthropo-ecological as it involves interaction between abiotic, biotic and anthropogenic factors and the decisive factors are the anthropogenic, as T. Beckman states: "We cannot discuss and understand ourselves until we acknowledge and understand the environment to which we are related. Most of environmental abuse, today, starts within and is caused by the contemporary fact that we are short-sighted and ignorant about the specific environs that nurture us."[9] *Human exemptionalism* (Adler, 1993), regarding humans above nature, independent of it, cannot give rational explanation of environmental problems.[11] *Anthropocentrism*, interpreting environment exclusively in terms of human values and experience as if humans are the central element of the universe, also does not give adequate viewpoint for responsible human behavior to prevent and solve environmental problems (Grey, 1993).

Environmental policy motives behind environmental policy-making are predominantly economic. Economic criteria constitute the foundation of decisions making about the design, performance and evaluation of production and consumption. Malthus (1896) presented his theory on population dynamics and its relationship with the availability of resources. He stated that the development of mankind was severely limited by the pressure that population growth exerted on the availability of food. Population growth is geometrical, but food production − arithmetical. The theory evoked lots of discussion and controversy that has not ended yet. Many authors try to refute his claims, showing how common property could be successfully managed by

group using it, (Ostrom, 2007), and how the causes of famine can be overcome (Sen, 1995, 1999). In the industrialized countries living standards improve permanently without a subsequent increase in population growth rate. Technological improvement and capital accumulation are strong forces that relax the population pressure, improve the living conditions in the presence of growing population (*technological determinism*) (Latour, 1996). *Neo-Malthusians* propose a doctrine advocating control of population growth. Taking into account the carrying capacity of ecosystems and the biosphere as a whole their doctrine needs consideration (Abramitzky & Braggion, 2004; Galor & Weil, 2000; Galor & Moav, 2001, Deval, 2007). Many authors, sociologists, economists and political scientists criticize capitalist political economies for causing degradation of the environment independent of abstract population[12)] (Foster, 1999; Elwell, 2009). Organized degradation of rain forests is caused by states and capitalists who push people off the land before it is degraded, by organizational means (Schnaiberg, 1980). The economic synthesis of Schnaiberg states that the desire for economic expansion will prevail over ecological concerns and that is the case in eastern countries after the collapse of socialism. Policy has decided to maximize economic growth at the expense of environmental disruption. His second statement concludes that governments will attempt to control only direst of environmental problems to prevent health and economic disasters, giving the impression that they act more environmentally than actually do. His third statement refers to a hypothetical case when environmental situation is so severe that governments respond with sustainable policies. Economic damage caused by environmental degradation serves as a driving force to sustainability accompanied by rational use of renewable resources.

Schnaiberg′s metaphoric expression, *the treadmill of production*, is a model of conflict and cooperation between the state, monopoly capital and organized labor. All the three groups have one desire in common – economic

expansion, which ends up in more goods and greater income. Political capitalism works against smaller scale capitalism and against other alliances of labor, as it is based on the propaganda that worker consumption can only be achieved through further capitalist consolidation. That acceleration of the treadmill establishes the consumer society, which increases the tension in state environmental-policy making as economic policies are subject to less and less environmental assessment (*eco-marxism*) (Foster, 2002, 2006; Elwell, 2009). The ecological illiteracy of the state and worker leaders is the reason for the support that both of them give to the monopoly capital and at the same time to deterioration of the environmental quality. Armed with ecological culture and consciousness, state and working labor movements may design policies to shrink the scale of the economy and the consumptive requirements and solve environmental problems.

The treadmill model demonstrates that the choice between barbarism and civilization is not simply a question of the organization of the human relations within society but also a question of the organization of the human relation to the environment. Buttel (2004) supported this model as it helps to explain the expansion of environmental problems in the modern era. Owners of the means of production, who seek to increase profit, induce advances in technology. These advances drive the expansion of production and consumption synergistically (economic expansion and increased consumption). A path of production starts that needs more production because all sectors of society depend on continued economic growth to solve the problems of unemployment, generated by mechanization, which are created by growth itself. The solution of social and environmental problems is sought in speeding up the treadmill. Economic expansion favors the large firms and is accompanied with alliances among capital, labor and governments[13]. Environmental problems cannot be solved because growth increases the demands on environmental resources and generates pollution (Commoner, 1971). Thus achieving environmental sustainability, characterized by

maintaining both social equity and environmental protection requires radical restructuring of the political economy and overcoming the growth dependence.

Ecological modernization, starting through both state and capital restructuring, attempts to integrate economic growth with environmental protection (Mol & Sonnenfeld, 2000; Fisher & Freudenberg, 2001; Spaargaren et al, 2006). The theory of ecological modernization is practically expressed by the following examples: cradle to cradle (regenerative) production cycles, industrial ecology (rational use of resources and waste disposal), organic agriculture (crop rotation, green manure, compost, biological pest control), biomimicry (biomimetics, imitation of nature), permaculture (sustainable land use design on ecological and biological principles), agroecology (application of ecological principles to the production of food, fuel, fiber and pharmaceuticals). It is a holistic economic, industrial and social framework that seeks to create efficient and waste free systems, insuring sustainable development.

Ecological crises in modern society need a system analysis leading to theoretically, methodologically and normatively opened up political theory, which has to account for fundamental fragility and mutability of social dynamics, shaped by globalization of capital and risks at the beginning of 21st century (Beck, 1992, 2008; Eckersley, 1992; Gould, 1996; Gould et al., 1998; Little, 1991; Mosquin & Rowe, 2004; Tolan, 2009). *Reflexive modernization*, constructed as a theory of *cosmopolitan modernity,* requires reflecting the benefits of modernization and industrialization and transforming the whole political and economic system′s institutions, making them more rational with ecology in mind (Beck & Grande, 2010; Mehta & Ouellet, 1995).

The diversity of views, reflecting the complexity of nature-society interdependence, makes it difficult to construct a general paradigm, encompassing the many aspects of ecological concerns, as there are rational elements in each theory. Nevertheless a modern integrated socio-eco-political

theory is being in the process of development but no theory can solve anthropo-ecological crises without ecological culture, consciousness and behavior of the whole of humanity.

Theoretical framework

The studies and explanations of human-environment relationships on different levels – individual, group, societal, political, economic, organizational, etc., is of great value for the development of a scale to measure environmental concern of people. Different types of social paradigms, such as the Order paradigm, the Pluralist paradigm and the Conflict paradigm (Purdue, 1986) had been experienced by human societies in their historical development.

The term "paradigm" means a pattern or an example, serving as a model or standard, a shorthand description of the worlds view. It implies a set of assumptions, concepts, beliefs, values, and practices that constitutes a way of viewing reality for the community that shares them. An environmental social paradigm can be used to describe a new way of thinking about how people approach their activity after they have seriously considered the impact on production efficiency, economic validity, social responsibility and environmental compatibility. These four factors can be represented like four sides of a pyramid and come together to form a strong structure, which can become a personal philosophy for every day behavior.[14]

The Human Exemptionalist Paradigm (HEP) was dominant within the social sciences till the 1960s. According to it humans are exempt from laws of nature, because they have special attributes that make them different from other species and human technology can overcome limits. The HEP claims that human-environment relationships are unimportant sociologically because humans are independent from environmental forces through cultural change. Human dominance is justified by the uniqueness of culture, which is more

adaptable than biological traits. The natural world cannot pose limitations because people control their own destiny (Fig. 1, Economic model).

The Dominant Social Paradigm now (DSP) represents a shift from democracy to corporate rule, which favors economic growth, scientific development, competition, free market economy, care for the present population without thinking about the future, exploiting the grow-or-die principle, combining financial and political resources and enduring risks.[15,16] It expresses only the values and beliefs of the ruling elite, interested in the reproduction of the existing institutions that secure also the reproduction of their own political, economic and social power (Schnaiberg, 1980; Buttel, 2004; Beck, 2008; Purdue, 1986; Dunlap et al., 2000; Kilbourne, 2004). DSP comprises three basic beliefs.[16] (1) Technology will spare the planet and all detrimental things can be resolved with continued pursuit of industrial advancement; (2) Economic growth, measured by the Gross National Product (GNP), and prosperity will resolve societal problems. The primary goal of any Government is to increase production of commodities and to satisfy the material wants; (3) Political representatives in office are there for the benefit of people and their country and only they have the capacity to handle policies that effect society as a whole (Fig 1, Sociologic model).

Many thinkers are supporting and still more are questioning it (Foster, 1999; Kilborne et al., 2002; Devall, 2007; Рубанова, 2007, Яницкий, 2006).

Devall (2007) represented two views on human-nature interactions – that of reformist environmentalism (shallow ecology), which preserve DSP and that of revolutionary (deep ecology), which seeks a new metaphysics, epistemology, cosmology and environmental ethics of person/planet system. He formulated 15 principles of deep ecology view, which mark the main parameters of a new social paradigm.

Dunlap & Van Liere (1978) recognized the limits of HEP and DSP and suggested a new perspective that took environmental variables into fuller

account in the New Ecological Pyramid (NEP). Jones[11] represents visually the relations between the different paradigms (Fig 1, NEP).
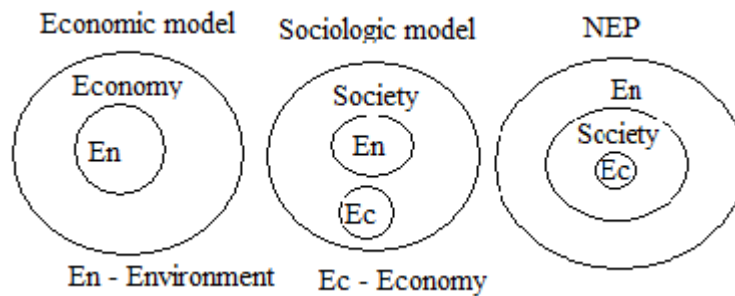
Fig 1. Different visual representations of the models of human-environment relation

According to NEP people have innovative capacity but are still ecologically interdependent as with other species. Social and cultural forces have their significant roles but that does not mean social determinism. NEP seeks environmental protection and procurement through limitations on industrial and population growth. It recognizes the detrimental effect of human-influenced interactions with their surrounding natural landscape.

Humans are impacted by the cause, effect and feedback loops of ecosystems (Dunlap & Catton, 1994) and the biophysical environment can impose constraints on human activity because the earth has a finite level of natural resources and waste repositories (Fig 2).

Carrying capacity denotes the number of individuals who can be supported in a given area within natural resource limits without degrading it for present and future generations.[17] It is not fixed and can be altered by the use of improved technology but mostly the change is for the worse. The growing population exercises the pressure because every member of the society requires resources and creates wastes. No population can live beyond the environmental carrying capacity for a long time. This is an ecological law, which cannot be altered by humans and should not be overlooked. Any

population exceeding the carrying capacity of the ecosystem is bound to collapse.

Catton &. Dunlap (1978) describe three competing functions of the environment. *Housing, transport systems, represents living space function* all ecological factors that make suitable living conditions for humans. Overuse and crowding bring destruction of habitats of other species and of man himself. *Supply depot function* denotes the amount of renewable and non-renewable resources (water, forests, fossil fuel, etc.) available for humans from the earth. *Waste repository function* views the environment as a sink for garbage (rubbish), sewage, industrial pollution and other by-products. Overuse exceeding the carrying capacity results in health problems. The three competing functions of the environment describe the ecological basis of environmental destruction very well. Each of these functions competes for space impinging upon the others. The model expands human ecology beyond the exclusive concern of living space (urban ecology) to the environmentally relevant functions of supply and waste disposal. It has a time dimension, which shows the deepening of the crisis, and besides it accounts for a visible practical situation.

Both DSP and NEP represent the vast majority of people within the world. More than three decades of their existence accompanied by research and discussions have not brought the two views to a consensus on the proper route to take in order to resolve environmental issues and no one expects that all arguments will come to fruition.[16]

NEP is supported by the theory of reflective modernization that answers the problems of second modernity as distinguished from post-modernity (Beck & Grande, 2010). While post-modernity deals with deconstruction only, second modernity is interested in both deconstruction and reconstruction of new concepts to understand the world dynamics at the beginning of 21st century. Reflexive modernity means to modernize the foundations and address the problems of the new reality, posed for individual

and collective decisions and the problems that arise from these decisions for the theory (Beck, 1992).

Fig 2. Competing functions of the environment: a) 1900; b) current situation (Hannigan, 2006).

Beck′s model (Fig 3) considers the relationship of modern industrial society to the resources of nature and culture on the existence of which it is constructed but which are being dissipated in the wake of a fully established modernization. Society creates threats and problems, which exceed the foundations of social ideas of safety, and people, having become conscious of them, are apt to shake the fundamental assumptions of the conventional social order. It is a problem of business, law, science and a particular problem of political action and decision-making. Collective and group-specific sources of meaning in industrial society culture, such as classes consciousness and faith in progress, are suffering from exhaustion, break up and disenchantment. In the global risk society an individualized process starts with a different meaning. Individuals have to rely exclusively on themselves for perceiving, interpreting and handling opportunities and threats. They can no longer rely on family, village community, social class or group. Individuals have to make

decisions without being able to consider the possible consequences owing to the complexity of modern society.
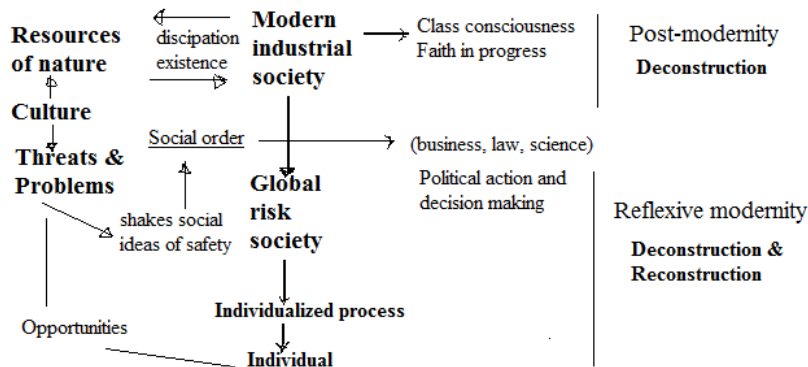
Fig 3. A model of reflexive modernization in global risk society based on Beck's theory

People become aware of the necessity of a new reflexive self-determination only within the concept and in the perspective of a risky society. Social conflicts are no longer treated as problems of order but as problems of risk. Participation in work presupposes participation in education and both presuppose mobility and readiness to be mobile. The risky society requires expansion of education, strong demands for mobility in the labor market, advanced juridification of labor relationships.[13] The individual is the subject of entitlement and obligations and is called upon to plan, understand, design and act in order to avoid the consequences in case of failure, which will be self-inflicted. This once again brings us to the necessity and the priority of environmental education of each individual to make him or her aware of and reflective upon everybody's responsibilities for the state of the environment. That is why the interest in the scales for measuring environmental concern is so wide. There are hundreds of EA measures available, based on different conceptual and theoretical frameworks, but most of the researchers prefer to

generate new measures (Table 1). That increases the multiplicity of thought and understanding of attitudes but hinders comparative assessment and evaluation.

Table 1. Some assessment instruments of ecological attitudes (EA) and knowledge

Author	Assessed aspects
Maloney et al., 1975	**The Ecology Scale**. A scale consisting of 4 subscales: Verbal commitment (10 items), Actual commitment (10 items), Affect (10 items) and Knowledge (15 items).
Weigel & Weigel, 1978	**The Environmental Concern Scale**. A 17 items scale consisting of 4 subscales measuring environmental optimism, the relative importance of environmental issues compared to economic and technological progress, attitudes towards specific environmental issues and personal impacts.
Dunlap & Van Liere (1978)	**The New Ecological Paradigm.** A 12 item scale measuring respondents′ attitudes towards ecological issues from human influence on the balance of nature, limits to growth on the human population size and whether humans should have dominance over nature.
Synodinos, 1990	Assessment of business students' verbal commitment, actual commitment, affect and knowledge about environmental issues. Environmental values neglected in business curricula. (Uses The Ecology Scale – Maloney et al, 1973)
Chan, 1996	A questionnaire of three parts: general environmental attitudes (11 items), behavioral intentions (4 items) using 5-point Likert scale and major sources of environmental information for students).
Keiser, 1998	Three types of ecological behavior measures applied: a general measure, 3 multiple-item measures and 3 single-item measures. Probabilistic measurement approach.
Kuhlemeier et al., 1999	Environmental knowledge, attitudes and behavior in Dutch secondary education: positive attitude to the environment. Actual behavior is regarded as a function of behavioral intentions and attitudes that in turn are affected by knowledge.
Dunlap et al., 2000	**The New Ecological Paradigm Scale.** A revised NEP scale, designed to improve upon the original one (1978) in several respects. Measure three dimensions: balance of nature, limits to growth and human domination of nature. All psychometric properties assessed.
Henry, 2000	Observation (150 individual) and a field journal for recording comments, questions and other narrative accounts of the *visitors* to Smithsonian institution exhibit on global warming, energy consumption, the greenhouse effect, etc.
Stern et al., 1992	Survey of dimensions of human responses: 1. Experienced versus anticipated change; 2. Deliberate responses versus actions with incidental effects.
Krosnick et al.,	Assessment of Thought & Knowledge → Beliefs → Attitudes

2006	→Behavior; Cognitive processes that form public judgments of environmental problem seriousness; causes of existence beliefs, causes of attitudes, causes of certainty.
Dutcher et al., 2007	Survey using five questions on environmental activism and cultural bias (5-point Likert scale). Environmental connectivity scale, Environmental behavior scale and Environmental concern scale. Assessment of Land owner's attitudes.
Kostova, Atasoy, 2008	Comparative evaluation of environmental culture of 8th grade students from Bulgaria and Turkey, using direct self-report technique with a questionnaire, containing 40 terms. Effect of social status and school entrance exams assessed.
Erdogan, 2009	Use of the revised NEP scale (Dunlap, 2000) with 15 items (5-point Likert scale); socio-demographic variables (gender, school status, socio-economic status);
Negev et al., 2010	Environmental literacy assessment with multiple choice and open-ended questions on problems, causes and solutions. Main environmental issues: solid wastes, open spaces and air pollution. Perceived solutions at the governmental level.
Milfont & Duckitt, 2010	**The Environmental Attitude Inventory** (EAI) with 12 specific scales is established through confirmatory factor analysis. Direct self-report methods are used. Structure of environmental attitudes – cognitive, affective and behavioral components, value analysis. Horizontal and vertical structure of EA.

NEP is the most frequently used measure of environmental concern and is widely acknowledged as a reliable multiple-item scale for environmental attitudes. It has been used for more than 30 years by psychologies, political scientists, sociologies and geographers but criticism is addressed to its theoretical foundations that is considered not to be comprehensively specified. The forms of anthropocentrism are well captured by the scale but "crucial elements of environmental ethics debate" are missing (Carina, 2007). It has not been placed in the context of a social-psychological theory of attitude formation or attitude-behavior relationship (Stern et al., 1992). It does not account for the specific context of the different communities (Erdogan, 2009). Nevertheless this ecological attitude assessment scale is easy to apply and work out, possesses the necessary psychometric properties and has not been replaced by a better one so far.

The longitudinal features of the Catton & Dunlap′s model have some similarities with Beck′s reflective modernization model (Hannigan, 2006) and

with revolutionary views of deep ecologists (Devall, 2007; Eduards et al., 2006)

The first version of NEP (1978) is a 12 Likert items scale, focused on water pollution, loss of aesthetic value and resource conservation. It surveys beliefs about humanity′s ability to upset the balance of nature, the existence of limits to growth for human societies and the humanity′s right to rule over the rest of nature. Its characteristics, such as group validity, predictive validity, criterion validity, content validity, construct validity, were investigated and found reliable. The revised second version of NEP – New Ecological Paradigm Scale (Dunlap et al., 2000) focuses on pollution hazardous wastes, ozone depletion, deforestation, loss of biodiversity, climate changes on a global level (Stern et al., 1992). It takes into account the fact that the environmental impact of local activities has global effects on the planet. It is composed of three distinct dimensions as the first version: balance of nature, limits to growth and human dominance of nature and can be used as a single scale or as multidimensional measure. It has 15 polar statements of Likert items scale, internally consistent instrument, measuring commitment to DSP and NEP. The items are constructed as follows: a) The reality of limits to growth -1, 6, 11 items; b) Anti-Anthropocentrism - 2, 7, 12 items; c) The fragility of nature′s balance - 3, 8, 13 items; d) Rejection of exemptionalism – 4, 9, 14 items; e) Possibility of an eco-crisis - 5, 10, 15 items.

The Questionnaire includes pro- and anti NEP statements. In the seven even numbered items (2, 4, 6, 8, 10, 12, 14) disagreement indicates pro-ecological view, while in the eight odd numbered items (1, 3, 5, 7, 9, 11, 13, 15) agreement indicates pro-ecological view. SA – strongly agree, MA – mildly agree, U – unsure, MD – mildly disagree. SD – strongly disagree. The higher the NEP scores, the more likely the problems are seen as serious. The NEP scale measures a wide range of ecological attitudes and behaviors.

Practical framework

Students, assessed in the investigation live and study in the town of Dupnitsa, situated in southwestern Bulgaria in the valley of middle Struma along the river Djerman. The beautiful mountainous and hilly scenery is severely affected by pollution and floods, especially in periods of heavy rains. The capacity of draining shafts is not enough to absorb all the rains water, which runs into people′s homes, underground garages and cellars. The situation becomes worse because of erosion of rivers banks, silting and throwing solid wastes in the river basin. Pollution from business, industry and households also increases. Trapped cars in the flooded areas block roads and cause traffic jam, which threatens human lives. Environmental values have been seriously neglected lately. Because of that assessment of environmental concern of students is important, as it is a first step in EE.

The current study should be of particular interest to the government, environmental groups, social organizations, universities, teachers, concerned individuals and any business companies incorporating environmental themes into their activities.

Using such a scale in schools gives information about the missing aspects of environmental education (EE), which should be attended properly on sound theoretical and practical grounds.

Research framework

The purpose of the study was to assess students` environmental attitudes using the revised NEP scale (Dunlap et al., 2000) in order to take measures for their improvement.

Study population and sample

The current study attempts to investigate the environmental attitudes of 76 nine-grade students (16 years of age), from three different specialties in one

secondary vocational school and make indirect conclusions about their environmentally responsible behavior. It took place in March and June of 2009. Industrial, commercial and domestic activities create global environmental problems, which cannot be solved by technology alone. Ecological crisis is the result of maladaptive human behavior. Therefore it is necessary to identify the factors that influence pro-environmental behavior in order to organize successful EE as through education of students, parents' knowledge and behavior can also be positively affected.

Attitude is considered one of most important influences on behavior. Judgments about the state of the environment are a function of beliefs about existence of ecological problems, attitudes towards them and the certainty with which these beliefs and attitudes are held. The Scale measures attitudes, certainty and existence beliefs as they are important factors for policy preferences with a special focus on environment protection. Attitudes are inferred from overt responses.

Method: A direct self-report method was used. A self-administered survey questionnaire was offered to students to collect the necessary data. The survey questionnaire was NEP translation in Bulgarian (Dunlap et al., 2000). Each student was allotted 30 minutes time to read the statements and to rate the extent to which they apply to him/her. The survey was repeated after a period of two months.

Mean scores and standard deviations for central tendency and frequency analysis for evaluation of distributions were used separately for each specialty and for the test and retest. Besides providing the percent and mean distributions for every item and specialty on the study scale, summary indexes were calculated in order to determine the overall environmental orientation. Two types of summary indexes were constructed: a) a summary distribution index for each item and for each of the three specialties; b) a summery distributions and means for each dimension of the scale. Reliability of the scale was determined by Pearson correlation coefficient of test and

retest. Means of pro-NEP (odd items) and pro-DSP (even items) were calculated. Each item was measured on a scale, ranging from 1 to 5. All pro-NEP responses were expected to be relatively high scores and all pro-DSP responses to be relatively low. The eight odd numbered items indicate pro-NEP attitudes and therefore responses were scored as 5 – strongly agree, 4 – mildly agree, 3 – undecided, 2 – mildly disagree and 1 – strongly disagree. The seven even numbered items indicate pro-DSP orientation; therefore the scores were reversed for them for the statistical analysis. The respondents comprised 34.21% of 9c class (electrical equipment), 31.58 % of 9a class (industrial electronics) and 34.21 % of 9b class (economics and management).

Results and discussion

The frequency distribution, mean scores and standard deviations for each item of the environmental concern scale are summarized in Tables 2 and 3.

Table 2. Frequency and mean distribution for NEPS items (9th grade[d]); Test; %

	Item[a]	SA	MA	U	MD	SD	Mean[b]	SD[e]
1	**We are approaching the limit of the number of people the earth can support**							
9c	Electrical equipment	5.88	23.53	17.65	47.06	5.88	2.76	1.06
9a	Industrial electronics	8.33	33.33	29.17	25.00	4.17	3.16	1.03
9b	Economics and management	77.27		13.63	4.55	4.55	4.36	0.91
∑	9c+9a+9b	31.75	19.05	20.63	23.81	4.76	3.49	1.28
2	**Humans have the right to modify the natural environment to suit their needs[c]**							
9c	Electrical equipment			17.65	52.94	29.41	4.17	0.68
9a	Industrial electronics	16.67	20.83	16.67	20.83	25.00	3.17	1.44
9b	Economics and management		4.55	4.55	18.18	72.72	4.59	0.78
∑	9c+9a+9b	5.56	8.46	12.95	30.65	42.38	3.96	1.18
3	**When humans interfere with nature it often produces disastrous consequences**							
9c	Electrical equipment	29.41	64.71		5.88		4.17	0.69
9a	Industrial electronics	50.00	37.50	12.50			4.37	0.69
9b	Economics and management	81.82	13.63			4.55	4.68	0.87
∑	9c+9a+9b	53.74	38.60	4.2	1.95	1.51	4.41	0.79
4	**Human ingenuity will insure that we do NOT make the earth unlivable[c]**							
9c	Electrical equipment	17.65	52.94	29.41			2.12	0.68

9a	Industrial electronics	16.67	20.83	45.83	4.17	12.5	2.75	1.17
9b	Economics and management	9.09	13.63	63.64	13.64		2.81	0.78
Σ	9c+9a+9b	14.47	29.13	46.29	5.93	4.2	2.56	0.95
5	**Humans are severely abusing the environment**							
9c	Electrical equipment	47.06	29.41	5.88	11.77	5.88	4	1.24
9a	Industrial electronics	75	20.83	4.17			4.7	0.54
9b	Economics and management	54.55	40.90			4.55	4.4	0.89
Σ	9c+9a+9b	58.87	30.38	3.35	3.92	3.48	4.38	0.98
6	**The earth has plenty of natural resources if we just learn how to develop them[c]**							
9c	Electrical equipment	64.70	17.65	5.88	11.77		1.64	1.03
9a	Industrial electronics	25	62.5	8.33	4.17		1.92	0.70
9b	Economics and management	27.27	27.27	22.74	13.63	9.09	2.5	`.03
Σ	9c+9a+9b	38.99	35.80	12.32	9.86	3.03	2.02	1.09
7	**Plants and animals have as much right as humans to exist**							
9c	Electrical equipment	52.94	29.41	11.77	5.88		4.29	0.89
9a	Industrial electronics	70.83	20.83	4.17	4.17		4.58	0.76
9b	Economics and management	90.91	9.09				4.9	0.29
Σ	9c+9a+9b	71.56	19.78	5.31	3.35		4.6	0.74
8	**The balance of nature is strong enough to cope with the impacts of modern industrial nations[c]**							
9c	Electrical equipment		5.88	23.54	64.70	5.88	3.7	0.49
9a	Industrial electronics		12.5	50	25	12.5	3.37	0.86
9b	Economics and management		4.55	45.45	18.18	31.82	3 .77	0.95
Σ	9c+9a+9b		7.64	39.66	35.96	16.74	3.62	0.84
9	**Despite our special abilities humans are still subject to the laws of nature**							
9c	Electrical equipment	52.94	35.29	11.77			4.41	0.69
9a	Industrial electronics	54.17	41.66	4.17			4.5	0.58
9b	Economics and management	68.19	18.18	13.63			4.54	0.68
Σ	9c+9a+9b	58.43	31.72	9.85			4.49	0.67
10	**The so called "ecological crisis" facing humankind has been greatly exaggerated[c]**							
9c	Electrical equipment	11.77	5.88	23.52	47.06	11.77	3.41	1.68
9a	Industrial electronics	4.17	20.83	25	41.67	8.33	3.46	1.07
9b	Economics and management			45.45	18.18	36.37	3.9	0.67
Σ	9c+9a+9b	5.31	8.91	31.32	35.64	18.82	3.54	1.06
11	**The earth is like a spaceship with very limited room and resources**							
9c	Electrical equipment	29.41	35.29	11.77	17.65	5.88	3.64	1.31
9a	Industrial electronics	12.5	45.83	33.33	4.17	4.17	3.7	0.92
9b	Economics and management	54.55	4.55	18.18	18.18	4.55	3.86	1.36
Σ	9c+9a+9b	32.16	28.56	21.09	13.33	4.86	3.70	1.19
12	**Humans were meant to rule over the rest of nature[c]**							
9c	Electrical equipment	5.88	11.77	11.77	47.06	23.52	3.7	1.13
9a	Industrial electronics	4.17	12.5	12.5	33.33	37.5	3.87	1.17
9b	Economics and management		4.55		36.36	59.09	4.5	0.55

№	Item[a]	SA	MA	U	MD	SD	Mean[b]	SD
Σ	9c+9a+9b	3.35	9.61	8.09	38.91	40.04	4.03	1.09
13	**The balance of nature is very delicate and easily upset**							
9в	Electrical equipment	23.52	47.06	17.65	11.77		3.82	0.92
9г	Industrial electronics	12.5	41.66	29.17	16.67		3.5	0.91
9д	Economics and management	36.36	36.36	22.74		4.55	4	1.02
Σ	9c+9a+9b	24.13	41.69	23.18	9.48	1.52	3.77	0.97
14	**Humans will eventually learn enough about how nature works to be able to control it[c]**							
9c	Electrical equipment	29.41	29.41	23.52	17.65		2.29	1.07
9a	Industrial electronics	16.67	20.83	29.17	16.67	16.67	2.96	1.29
9b	Economics and management		9.09	59.09	13.63	18.18	3.4	0.89
Σ	9c+9a+9b	15.36	19.78	37.26	15.98	11.62	2.88	1.13
15	**If things continue on their present course, we will soon experience a major ecological catastrophe**							
9c	Electrical equipment	70.59	23.52			5.88	4.53	0.97
9a	Industrial electronics	62.5	29.17	4.17	4.17		4.5	0.76
9b	Economics and management	86.36		9.09		4.55	4.63	0.98
Σ	9c+9a+9b	73.15	17.56	4.42	1.39	3.48	4.56	0.91

aSD = Strongly disagree, MD = Mildly disagree, U = Unsure, MA = Mildly agree, SA = Strongly agree;

bMean Likert scores after adjustment for direction. Higher score indicates pro-NEP worldview;

cPro-NEP worldview index for frequency distributions was calculated by allowing for the reversed direction of even-numbered items.

dN (number) of participants: 9c=26, 9a=24, 9b= 26

eSD (Standard Deviation)

Table 3. Frequency and mean distribution for NEPS items (9th grade[d]); Re-test; %

№	Item[a]	SA	MA	U	MD	SD	Mean[b]	SD
1	**We are approaching the limit of the number of people the earth can support**							
9c	Electrical equipment	42.30	34.62	11.54	7.69	3.85	4	1.09
9a	Industrial electronics	41.66	29.18	20.83	4.17	4.16	4	1.08
9b	Economics and management	46.15	26.92	15.38	7.69	3.86	4.03	1.13
Σ	9c+9a+9b	43.37	30.24	15.91	6.52	3.96	4.03	1.11
2	**Humans have the right to modify the natural environment to suit their needs**							
9c	Electrical equipment	11.54	34.62	11.54	34.62	7.69	2.92	1.21
9a	Industrial electronics	16.70	25.00	20.83	29.15	8.33	2.87	1.24
9b	Economics and management		7.69	34.62	38.46	19.23	3.69	0.87

Σ	9c+9a+9b	9.41	22.43	22.33	34.08	11.75	3.16	1.18
3	**When humans interfere with nature it often produces disastrous consequences**							
9c	Electrical equipment	53.85	26.92	15.38	3.85		4.3	0.87
9a	Industrial electronics	37.50	37.50	8.33	8.33	8.33	3.87	1.24
9b	Economics and management	50.00	42.31			7.69	4.26	1.06
Σ	9c+9a+9b	47.12	35.58	7.90	4.06	5.34	4.15	0.92
4	**Human ingenuity will insure that we do NOT make the earth unlivable**							
9c	Electrical equipment	23.08	19.23	38.46	3.85	15.38	2.69	1.3
9a	Industrial electronics	16.6	33.30	37.50	4.17	8.33	2.54	1.03
9b	Economics and management	3.85	38.46	53.85	3.85		2.57	0.63
Σ	9c+9a+9b	14.51	30.34	43.27	3.96	7.92	2.6	1.05
5	**Humans are severely abusing the environment**							
9c	Electrical equipment	57.69	38.46	3.85			4.53	0.57
9a	Industrial electronics	50.00	50.00				4.5	0.50
9b	Economics and management	61.54	23.07	7.69		7.69	4.3	1.14
Σ	9c+9a+9b	56.41	37.18	3.85		2.56	4.45	0.79
6	**The earth has plenty of natural resources if we just learn how to develop them**							
9c	Electrical equipment	38.46	46.15	7.69	7.69		1.84	0.86
9a	Industrial electronics	41.66	33.30	12.50	8.33	4.17	1.99	1.17
9b	Economics and management	42.31	42.31	7.69	7.69		1.81	0.88
Σ	9c+9a+9b	40.81	40.58	9.30	7.91	1.40	1.88	0.97
7	**Plants and animals have as much right as humans to exist**							
9c	Electrical equipment	42.31	38.46	11.54	7.69		4.15	0.91
9a	Industrial electronics	54.17	33.33	8.33	4.17		4.38	0.81
9b	Economics and management	61.53	34.62			3.85	4.5	0.84
Σ	9c+9a+9b	52.67	35.48	6.62	3.95	1.28	4.34	0.87
8	**The balance of nature is strong enough to cope with the impacts of modern industrial nations**							
9c	Electrical equipment	3.85		42.31	30.77	23.07	3.69	0.95
9a	Industrial electronics		8.33	37.50	33.33	20.83	3.67	0.90
9b	Economics and management			26.92	57.69	15.38	3.88	0.64
Σ	9c+9a+9b	1.28	2.77	35.58	40.60	19.77	3.74	0.85
9	**Despite our special abilities humans are still subject to the laws of nature**							
9c	Electrical equipment	50.00	38.46	11.54			4.45	0.76
9a	Industrial electronics	45.83	45.83	4.17	4.17		4.38	0.63
9b	Economics and management	46.15	46.15	7.69			4.38	0.68
Σ	9c+9a+9b	47.33	43.48	7.8	1.39		4.4	0.69
10	**The so called "ecological crisis" facing humankind has been greatly exaggerated**							
9c	Electrical equipment	7.69	11.54	19.23	26.92	34.62	3.69	1.27
9a	Industrial electronics	4.17	12.50	37.50	29.16	16.66	3.42	1.06
9b	Economics and management		7.69	7.69	26.92	57.69	4.35	0.92
Σ	9c+9a+9b	3.95	10.57	21.47	27.66	36.32	3.82	1.15
11	**The earth is like a spaceship with very limited room and resources**							
9c	Electrical equipment	30.77	26.92	19.23	15.38	7.69	3.58	1.28
9a	Industrial electronics		54.17	12.50	20.83	12.50	3.08	1.12
9b	Economics and management	19.23	57.69	15.38	3.85	3.85	3.85	0.91
Σ	9c+9a+9b	16.67	46.26	15.71	13.35	8.01	3.5	1.16
12	**Humans were meant to rule over the rest of nature**							
9c	Electrical equipment		11.54	11.54	30.77	46.15	4.12	1.01

9a	Industrial electronics	4.17	12.50	25.00	45.83	12.50	3.5	1.00
9b	Economics and management		11.54	3.85	23.08	61.53	4.35	1.00
Σ	9c+9a+9b	1.39	11.86	13.46	33.23	40.06	3.99	1.07
13	**The balance of nature is very delicate and easily upset**							
9c	Electrical equipment	15.38	42.31	23.08	11.54	7.69	3.46	1.12
9a	Industrial electronics	12.50	54.17	20.83	12.50		3.67	0.85
9b	Economics and management	30.77	53.85	11.54	3.85		4.12	0.75
Σ	9c+9a+9b	19.55	50.11	18.48	9.30	2.56	3.75	0.96
14	**Humans will eventually learn enough about how nature works to be able to control it**							
9c	Electrical equipment	7.69	23.08	34.62	30.77	3.85	3.00	1.00
9a	Industrial electronics	20.83	20.83	29.17	20.83	8.33	2.75	1.23
9b	Economics and management		3.85	26.92	53.85	15.38	3.8	0.73
Σ	9c+9a+9b	9.51	15.92	30.24	35.15	9.18	3.18	1.11
15	**If things continue on their present course, we will soon experience a major ecological catastrophe**							
9c	Electrical equipment	76.92	19.23			3.85	4.65	0.83
9a	Industrial electronics	66.67	25.00	8.33			4.58	0.64
9b	Economics and management	84.62	3.85	3.85		7.69	4.58	1.07
Σ	9c+9a+9b	76.07	16.03	4.06		3.84	4.60	0.89

The results indicate that the respondents in the two successive studies showed positive environmental attitudes. The mean scores ranged from 1.88 to 4.6 on a five-point scale. Students scored 65% strong and mild attitude on the test and 64.4% on the re-test. Those of them studying economics and management scored higher than the other two specialties on both test and re-test. Students scored highest and showed strong attitude on conservation of plants and animals (mean 4.6 on test and 4.34 on re-test. High scores (mean 4.41 and 4.38 on test and 4.15 and 4.45 on re-test) they demonstrated on items 3 and 5 respectively, agreeing on the disastrous effects of human interference with nature. Strong ecocentric attitudes are demonstrated on item 9 in both tests (mean 4.49/4.37) proving their understanding of humans as members of an ecosystem as all other living things. Three items with the lowest mean scores were attitudes on unlimited resources of the earth (item 6, mean 2.02/ 1.88 respectively), on trust in human ingenuity (item 4, mean 2.56/2.6 respectively) and on the abilities of humans to control nature (item 14, mean 2.88/ 2.38 for test/retest respectively). The lower mean scores are due to a high proportion of students, showing uncertainty.

The NEP scale is multidimensional and the attitudes vary depending on the particular dimension. The students least understood the first dimension, limits to population growth. They did not accept that the human population growth is approaching the carrying capacity of the biosphere (Tables 4 and 5). One reason for that may be the fact that the town of Dupnitsa is not overpopulated, another – because many people left the country as well as their houses empty and went abroad to earn their living, and still other, because the population growth curves and the carrying capacity concepts are not well represented in the ecology topics of the school curricula. The scarcity of natural resources is also unclear to students. Apparently they have great trust in science and expect scientists to discover new ways of using nature (technocentrism). The model of the earth as a spaceship was unclear for them and difficult to grasp. The unintended side effects and domination of power shaped by the globalization of capital and risks at the beginning of 21st century are concepts beyond students grasping. They still have to think about the finite level of natural resources and the constraints of biophysical environment on human activity. But the inequity and inequality of human use of natural resources and other values of nature should also be considered as explanation of the results.

Table 4. Frequency and mean distribution for **Limits to Growth**; Test; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
1	9c+9a+9b	31.75	19.05	20.63	23.81	4.76	3.49	1.28
6	9c+9a+9b	38.99	35.8	12.32	9.86	3.03	2.02	1.09
11	9c+9a+9b	32.16	28.56	21.09	13.33	4.86	3.70	1.19

Table 5. Frequency and mean distribution for *Limits to growth*; Re-test; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
1	9c+9a+9b	43.37	30.24	15.91	6.52	3.96	4.03	1.11
6	9c+9a+9b	40.81	40.58	9.30	7.91	1.40	1.88	0.97
11	9c+9a+9b	16.67	46.26	15.71	13.35	8.01	3.5	1.16

Frequency and mean distribution of environmental attitudes concerning *anti-anthropocentrism* (Tables 6 and 7) are acceptable and indicate that students did not look upon humans as rulers over nature (item 2) and cared for the protection of plants and animals (item 7). A greater part of them did not think that humans should have the right to modify the earth (item 12). This conviction may be due more to the indescribable beauty of the mountain around their town and its proximity than to education in school. They probably sensed that humans were embedded in the ecosphere and evolved alongside other species than consciously understood it. Their ecological consciousness was on the way of development but had not reached the expected functional level. What was obvious from their responses was the idea that nature was not created for the benefit of man only.

Table 6. Frequency and mean distribution for *Anti-Anthropocentrism; Test*; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
2	9c+9a+9b	5.56	8.46	12.95	30.65	42.38	3.96	1.18
7	9c+9a+9b	71.56	19.78	5.31	3.35		4.6	0.74
12	9c+9a+9b	3.35	9.61	8.09	38.91	40.04	4.03	1.09

Table 7. Frequency and mean distribution for *Anti-Anthropocentrism; Re-test*; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
2	9c+9a+9b	9.41	22.43	22.33	34.08	11.75	3.16	1.18
7	9c+9a+9b	52.67	35.47	6.62	3.95	1.28	4.34	0.87
12	9c+9a+9b	1.39	11.86	13.46	33.23	40.06	3.99	1.07

Students' attitudes on the delicate nature of the *ecological balance* were highly positive (Tables 8 and 9). They considered the disastrous effects of human activities on ecological equilibrium (item 3), the ever growing industrial load on it (item 8) and the unpredictable consequences of its change (item 13). Other species should have the right to perform their own evolutionary history. Man is an integral part of nature, not over, or apart from it. The fragility of nature lies in its long evolution, which resulted in the complex entity of the biosphere. There is "wisdom in the stability of natural processes unchanged by human intervention. Massive human-induced disruptions of ecosystems will be unethical and harmful to man-design for human settlement should be with nature, not against nature" (Devall, 2007).

Table 8. Frequency and mean distribution for *Fragility of nature's balance; Test; %*

	The fragility of nature's balance Test (N=76)							
Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
3	9c+9a+9b	53.74	38.60	4.2	1.95	1.51	4.41	0.79
8	9c+9a+9b		7.64	39.66	35.96	16.74	3.62	0.84
13	9c+9a+9b	24.13	41.69	23.18	9.48	1.52	3.77	0.97

Table 9. Frequency and mean distribution for *Fragility of nature's balance; Re-test; %*

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
3	9c+9a+9b	47.12	35.58	7.90	4.06	5.34	4.15	0.92
8	9c+9a+9b	1.28	2.77	35.58	40.60	19.77	3.74	0.85
13	9c+9a+9b	19.55	50.11	18.48	9.30	2.56	3.75	0.96

Human exemptionalism did not appeal to students very much. They positively moved to ecocentrism (Tables 10 and 11). A considerable part of them showed uncertainty, which was supported by the strong beliefs in human intellectual abilities and in the benefits of learning and understanding natural

laws. That human beings have special attributes that make them different from other species should not and cannot be denied and that they are the products of both biological and social evolution either. The significant point here is the responsibility of humans for the maintenance of ecological equilibrium. That was not clearly understood by the majority of students and they overestimated the role of technology, moving closer to DSP. Nevertheless they did not place humans above the laws of nature that demonstrated their hesitation and indecision between DSP and NEP. From students in this college we expect strong ecological attitudes because in their future professions they should responsibly interact with other components of the ecosystem.

Table 10. Frequency and mean distribution for *Rejection of exemptionalism*; Test; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
4	9c+9a+9b	14.47	29.13	46.29	5.93	4.2	2.56	0.95
9	9c+9a+9b	58.43	31.72	9.85			4.49	0.67
14	9c+9a+9b	15.36	19.78	37.26	15.98	11.62	2.88	1.13

Table 11. Frequency and mean distribution for *Rejection of exemptionalism;* Re-test; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
4	9c+9a+9b	14.51	30.34	43.27	3.96	7.92	2.6	1.05
9	9c+9a+9b	47.33	43.48	7.8	1.39		4.4	0.69
14	9c+9a+9b	9.51	15.92	30.24	35.15	9.18	3.19	1.11

The attitudes on the high probability of ecological catastrophe were very strongly positive (Tables 12 and 13). First, the pollution of their surroundings, the degradation of the ecosystems and the diminishing quantity and quality of biodiversity, taking place before their eyes convinced them in the existence of heavy ecological problems. Besides that, they experienced the disastrous effects of human activity during the heavy floods, affecting their homes. Secondly the school learning contents emphasized the problems of pollution and nature degradation. They did understand that modern society is

unsustainable but could not accept the idea that economic growth should come to a standstill due to ultimate limits of resources and that limits to population growth have to be considered. They were more inclined to ideological but not to science-driven analysis. Finally the views of a considerable part of them supported the treadmill of production. Poverty and ignorance are much greater causes to destruction. Economics must be subordinate to ecological ethical criteria and that is quite possible as Humans are the only living things on Earth that create values. In modeling the future EE more attention should be given to the rate of population growth, which for some ethnical groups is beyond understanding. "Optimal carrying capacity should be determined for the planet as a biosphere and reduction of the rate of growth of population of Homo sapiens through humane birth control programs is required" (Devall, 2007).

Table 12. Frequency and mean distribution for *Possibility of an eco-crisis;* Test; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
5	9c+9a+9b	58.87	30.38	3.35	3.92	3.48	4.38	0.98
10	9c+9a+9b	5.31	8.91	31.32	35.64	18.82	3.54	1.06
15	9c+9a+9b	73.15	17.56	4.42	1.39	3.48	4.56	0.91

Table 13. Frequency and mean distribution for *Possibility of an eco-crisis;* Re-test; %

Q	Assessed groups	SA	MA	U	MD	SD	Mean	SD
5	9c+9a+9b	56.41	37.18	3.85		2.56	4.45	0.79
10	9c+9a+9b	3.95	10.57	21.47	27.68	36.33	3.82	1.15
15	9c+9a+9b	76.07	16.03	4.06		3.84	4.60	0.89

The reliability of the test was measured by means of Pearson's coefficient comparing the results from the test and the re-test with the elapse of two months between them (Table 14).

Table 14. Reliability and mean distribution for the different dimensions of Test/Re-test

Items (Test – Re-test)	1, 6, 11	2, 7, 12	3, 8, 13	4, 9, 14	5, 10, 15	r^t Total
r – reliability coefficient	0.98	0.78	0.77	0,92	0.96	0.88
Mean Test/Re-test	3,07/3.14	4.2/3.83	3,93/3.88	3.31/3.39	4.16/4.29	3.73/3.71

More than 1/3 of the respondents scored very strong attitudes on the items (Table 15). Another third scored mildly agree. One fifth of the respondents showed uncertainty and were not able to make right decisions. The low mean scores on the even items (Table 5, columns 7 and 8) showed that students were not very well instructed about the structure of the items and that it was difficult for them to invert the way of marking the answers. This indicates that they were not adapted to such kind of thinking and were confused.

Table 15. Frequency and mean distribution for Test and Re-test;

Tests	SA%	SD%	MA%	MD%	U%	Mean odd	Mean even	Mean total
Test	36	6.5	29	10.4	18.1	4.18	3.23	3.71
Re-test	32.5	7.5	31.9	10.8	17.3	4.15	3.20	3.68

Students studying economics and management showed little higher positive environmental attitudes (Table 16).

Table 16. Mean distribution for the different specialties of Test and Re-test

Assessed groups	9c	9a	9b	Mean
Test	3.51	3.63	4.06	3.73
Re-test	3.67	3.55	3.90	3.71
Mean	3.59	3.59	3.98	3.72

There are a number of limitations to the study: 1) the sample used is small, not representative of the Bulgarian population and includes students from one age group; 2) students are assessed in the school; 3) assessment is only verbal; 4) not all aspects of human environmental attitudes are included in the scale and additional scales should be constructed to account more precisely to the aims of the study.

"Education should have as its goal encouraging the spiritual development and personhood development of the members of a community, not just training them to occupations appropriate for oligarchic bureaucracies and for consumerism in advanced industrial societies" (Devall, 2007).

The total rejection of classical Marxism's ecological concerns, dominating environmental sociology throughout the totalitarian period stimulated nature degradation and resources depletion ideologically. K. Marx provided a powerful economic analysis of the main ecological crisis of his days, which can help contemporary ecologists to understand the present ecological situation (Hunnigan, 2006; Elwell, 2009; Foster, 1999, 2006). The political economy explanation does not take into account the ecological basis of environmental destruction. The rate of unplanned establishment of market economy, accumulation of industrial capital and material growth of the ruling elite brought severe environmental destruction in the late twenty years in our country and made the activity of the green social movements very difficult. The increase of welfare and the increase of hazards mutually condition one another, which requires both environmental protection and economic growth to come into terms. As Mahatma Gandhi states: "Earth provides enough to satisfy every man's need, but not every man's greed."

For future research and education in this school and in other secondary schools as well it is necessary to introduce an improved model of EE for students, which places a greater emphasis on ecological knowledge, attitudes and behavior. More attention should be given to practical and interactive learning techniques and on new information technologies including CAL.

Many aspects of the impact of the twin processes of democratization and marketization on the environment under heavy economic crisis have not been attended yet (Beker & Jehlicka, 1998).

Conclusions

Based on the analysis of the studied authors, we accepted the NEP scale as an appropriate to measure the environmental concerns of students before designing a new model for EE in a vocational school. It reflects the main worldviews, both historically and contemporary in environmental sociology. The results and discussions proved it as a valuable instrument for assessing prior knowledge and attitudes to EE.

The analysis of results proved the very complex nature of environmental attitudes, their dependence on DSP, which gives priority to anthropocentrism. The vast array of world environmental views and the support they receive from society, media and the power elite confuse students and they sway between ecological sciences and necessities of everyday life, between nature's requirements and personal requirements, which often come into conflicts. Causes for environmental degradation are complex and synergistic and solutions are complicated. Students tried to maneuver this complexity by replacing strong attitudes with uncertainty, acting on the side of caution. They had not fully understood the fact that the environmental impact of local activities has global effects on the planet. It is not fully understood by society either, which has not dwelt consciously enough on the views of the cosmopolitan modernity theory and contemporary risks. Nevertheless students demonstrated positive attitudes to their environment, which is due to education.

Knowledge does not instantly turn into beliefs, attitudes and behavior. Ecologically attitude directed learning should come in terms with human cognitive architecture and should employ learning by doing, new information technologies and reflective discussions. Some improvements of school

curricula, placing greater emphasis on the ecological concepts and their relations to everyday life and on the new interactive constructivists teaching strategies, are strongly required. More attention should be given to the link between knowledge, beliefs, attitudes, values and behavior. It is also interesting to know how environmental attitudes develop from kindergarten to adulthood and which teaching and learning strategies are most beneficial.

Learning strategies of ecology should be changed so that students learn from the book of nature and from real life and not only from textbooks and lectures. Systematic assessment of students` attitudes and development of practical skills should also be taken into account.

NOTES

1. http://www.answers.com/topic/environmentalism

2. http://www.wetland.org/educationhome.htm

3. http://www.answers.com/topic/cultural-movements-events-and-institutions-related-word-list

4. http://www.answers.com/library/Political%20Dictionary-cid-27010

5. http://www.answers.com/library/Geographical1%20Dictionary-cid-27010

6. http://www.northwestern.edu/ipr/publications/papers/2004/schnaiberg/17_TreadmillEnvirState.pdf Schnaiberg, A., Pellow, D. & Weinberg, A. (2000). The treadmill of production and the environmental state.

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8. http://www.gennet.org/facts/haeckel.html Ernst Haeckel

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APPENDIX: World sociological views on human-environment relationship

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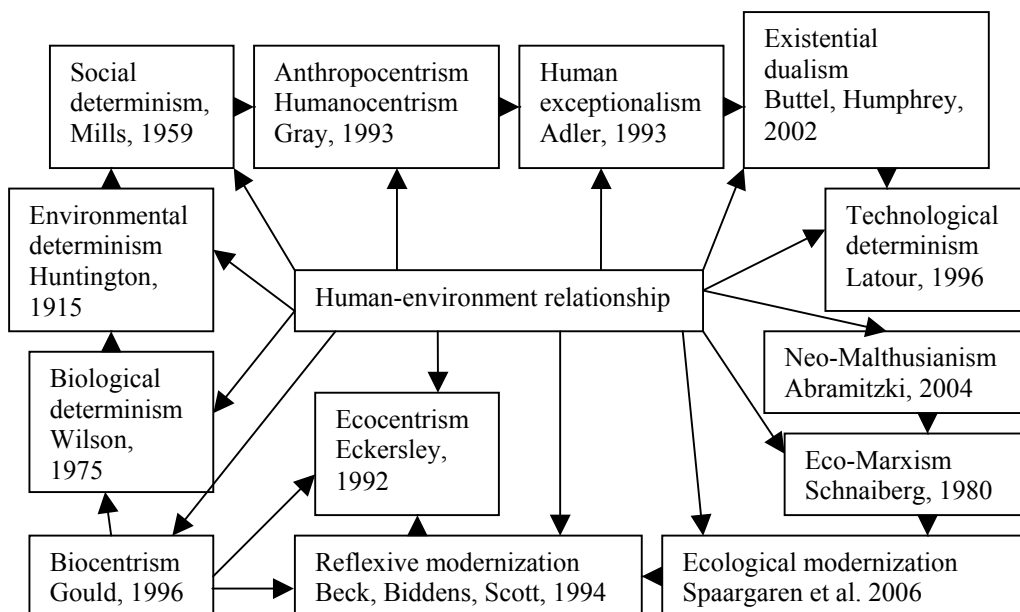
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AN INVESTIGATION OF THE HEAT CONCEPT WITH COMPUTER MODELS

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Abstract. The purpose of this study is to investigate how students understand thermodynamic concepts such as temperature, heat and energy, and how they can enhance understanding of these concepts more easily via computer models. Students often show difficulties imagining matter molecules, temperature, heat and heat energy, some of the subjects studied at high schools in most of developed countries. Semi-structured interviews and written exams were used to explore students' ideas and their mental models. In addition, computers and computer applications are used for this purpose. With 6th grade students, computer models are compared with the traditional educational methods currently dominant in Turkey. They are considered to possess some level of developed concepts of temperature, heat, energy, and matter structure because they have already taken some fundamental courses on these topics. The implications and recommendations for pedagogy are discussed in the conclusion section of this paper.

Keywords: interactive learning environments, computers in education, simulations, secondary education

Introduction

Model concept

Every student learns best in various ways such as hands-on and touch-ing, hearing, and seeing. Different methods and means can be used (White & Gunstone, 1992; Tunnicliffe & Reiss, 1999). Since educators employ several methods, because students are incapable of carrying out complicated experi-ments themselves, and applied (practical sessions) are unproductive because students tire rapidly, applied classes do not yield the desired result. Therefore, science educators utilize a variety of models in order to help students under-stand scientific concepts.

Prior to investigating the topic, the assets of a model should be first discussed. A model is defined as the symbolization or the visual demonstra-tion of a phenomenon, a matter or an idea (Gilbert et al., 2000). The model is related to some characteristics of the targeted issues. From some aspects, the characteristics of the target should be established with the model (Driel & Verloop, 1999). An example could be depicting the mitochondria, the cells' power sources.

Models in science education

Different types of models can be used in science education (Ornek, 2008): (1) conceptual (mathematical, computer, physics) models; (2) mental models.

(a) Conceptual models

Computer models are primarily designed to enable phenomena in stu-dents' real world to be expressed quantitatively or visually. Different software is used to this end. This software could be models, animations or simulations (Holland, 1988). Some computer programs may ease the analysis of very complicated systems to a great extent. It can be particularly hard at times to define or analyze mathematical problems by means of computers (Chabay &

Sherwood, 1999). To this end, many commercial packages have been developed in a student-friendly manner. These mentioned packages, are usually animation or simulation programs.

By means of pictures, two- or three-dimensional animations, graphics, vector and quantitative data display, computer simulations help students to comprehend particularly complicated topics (Sherer et al., 2000). Students cannot analyze these complicated topics by computer programming (given that programming is in itself a complicated task). However, packages, flash programs or java applets can help overcome this problem. The only thing students need do is to change the parameters. In this case, students can develop a model by themselves, rather than writing a whole program from scratch. Therefore, both teachers and students can use special ready-made computer simulations conveniently in fields such as chemistry, biology and physics alike.

(b) Mental models

The concept "mental model" is attributed to the Scottish psychologist Kenneth Craik. According to Craik, concepts formulated in the mind are small-scale models of reality for predicting future events and explaining concepts (Craik, 1943). To Craik, the mental models are dynamic symbols of the outer world. Johnson-Laird (1983) developed a mental model theory and interpreted it as the various explanations of an event in the mind. Mental models are representatives of this meaning. This is not a logical structure (such as in propositions) or representation of some artificial concept (such as circles standing for sets), merely the existence of a simple object in relation to a situation. Obviously, a simple idea can be expanded and represented. However, the advantage of such an idea is its simple and natural representation of the world. Johnson-Laird demonstrated that, with the assumption that there is no

capacity limit; the mind pioneer can achieve logically valid results with mental models.

Franco also defined mental models as psychological representations of reality and dreams. He contended that these occur in the human mind as human perceptions and concepts (Franco & Colinvaux, 2000). According to Gentner & Stevens (1983), mental models affect our comprehension of knowledge and perception of events associating new knowledge to prior knowledge. Other researchers defined the mental models as inner reflections of our knowledge about the world (Coll & Treagust, 2003; Gentner and Stevens, 1983; Gilbert et al., 1998, 2000; Johnson-Laird, 1983). In addition, it is known that mental models change according to people's points of view of events.

Background

The concept of energy and heat in the science education literature

The topic of energy and students' difficulties in learning has been an intriguing research subject in science education. Many researchers have focused on how students learn energy concepts (Watts, 1983; Duit, 1984; Solomon, 1983, 1992; Trumper, 1993). The main point of this body of research pioneered some important findings by encouraging students to focus on energy as a concept that is an aspect of living organisms, to relate it to daily life and to tackle it in general along with the concept of motion (Solomon, 1992).

Yeşilyurt (2006) contributed to these studies with his research employing interviews and written exams administered to high school students in Turkey. He observed that students had some conceptual errors regarding temperature and heat. He observed that although students answered correctly how matter is heated, they had misconceptions or misunderstandings about how heat is spread. He found 60 per cent of the students understood the concepts of heat-temperature; however, they didn't have a mental model.

Liu & McKeough (2005), also, focused on the concept of energy. Their study observed students at three stages. The first stage was vector section 1 (i.e., ages 11-13), the second was vector section 2 (ages 13-15) and the third stage was vector section 3 (ages 15-19). They observed that while life experiences increased towards adolescence, accompanied by an increase in experiences regarding the concept of energy, the concepts regarding the relationship between energy resources and forms originated in vector section 1 at the first stage. They realized that once this coordination took place, students were able to conceptualize energy transfer (e.g., energy from a generation station travels to a house to run the furnace and the furnace in turn heats the house). Following the hypotheses of Liu & McKeough, students reached a bifocal way of thinking and passed to the second section of the second stage when they, at the age of 13-15, realized that the heat produced is, in fact, energy loss. Understanding the concept of energy loss, students then focused on both energy used for work and energy loss. In the third section of the third stage, adolescents at the age of 15-19 conceptualized energy for diverse systems, and they could measure the energy in a closed system. According to researchers, this stage is when the concept of energy is fully understood.

Method and material

Many researchers have investigated the effects of computer models in education and learning systems. The effect of software simulation has been studied using the curriculum that best supports student learning. 'Vacuum and Particles', a unit that explicitly addresses students' difficulties, is available in Israel (Nussbaum, 1996). A longitudinal study conducted on 1,302 middle school students showed that over 80% of the students who used 'Vacuum and Particles' experienced a conceptual change regarding the particulate nature of matter in contrast to far less change in the control group who studied 'Into the Matter.'[1]

Research sample

The subjects of this study were teachers and 37 6th grade students (age 11-12) from the same school located in the Central Anatolian region of Turkey. Groups were randomly selected as a control group (n = 17; 4 girls and 13 boys) and an experimental group (n = 20; 6 girls and 14 boys). Only students that responded to the pre-test and the post-test were included in the study. The teachers told the experimental and control groups what they should do. Then they guided them; finally the teachers exchanged their groups.

Research design

1. First step

(a) The first chapters of the units 'Matter' and 'Heat and Energy' were taught to each group. These chapters presented concepts such as matter, properties of matter, heat energy, heat transfer and phases of matter. In addition, the concept of matter being made up of small particles was introduced; (b) A pre-exam questionnaire was administered.

First teachers taught the subjects of heat and temperature. They used classic educational methods and employed a pre-exam and semi-structured interview (Eq. A.). This classic exam was worth 70 points. Its purpose was to evaluate the students' pre-knowledge of energy and heat energy.

Many statistics programs were used to carry out data analysis and data collection. In particular, SPSS was very useful. The SPSS program can calculate a lot of factors and tests. In this study the SPSS program was used both for data collection and data analysis. This program made it easy to calculate the t-test and F test value. In addition, the examination results of male and female students were also compared, see Table 1.

Table 1. Comparison of girls and boys pupils for control group in the pre-exam

Pupils	N	Mean	Standard Deviation	Standard Error
Girls	4	22,50	5.00	2.50
Boys	13	20,00	7.00	2.00

As shown in Table 1, the female students' mean was 22.50, while the male students' mean was 20.00. Therefore, there was no important difference between the two.

2. Second step

(a) The chapter, 'Heating and Cooling, and Heat Transfer' was taught for six class periods to the control and experimental groups. The students were taken lessons in the laboratory for three hours. Computerized simulation was only used the experimental group; for this purpose a heat and energy simulation was taken from the website;[2)] (b) A post-exam questionnaire was administered; (c) 17 students from the experimental group and 20 students from the control group were interviewed.

In the second stage, teachers explained the concepts and the lesson. At this point the computer simulations with the interactive program, shown in Fig. 1, were used. These were applied to post-exam. This, therefore, facilitated a comparison of the students' success. Then, a post-exam and a semi-structured interview were conducted with the students, (Eq. B.). This exam was worth 60 points. Also, ANOVA was applied and F and t values were calculated through the SPSS program.
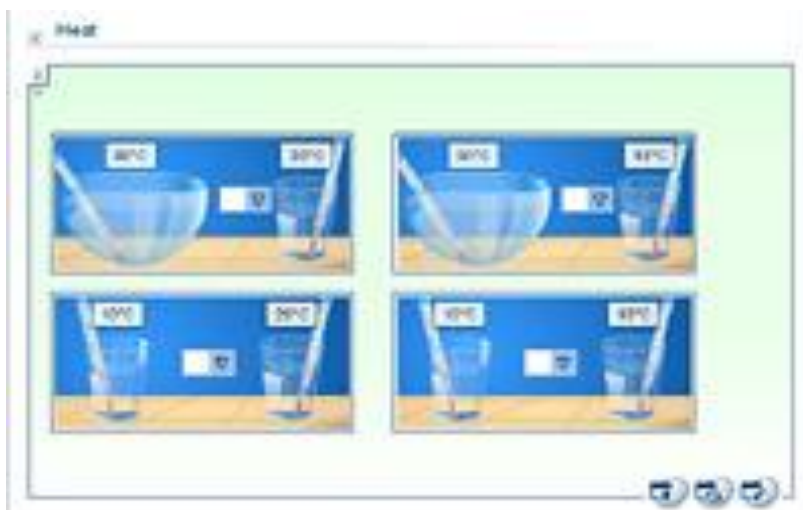
Fig. 1. An interactive programme about heat

The SPSS program was used in the same way as in the first step. Results were examined to see whether there was any difference between female and male students in terms of success (see Table 2). The number of female students in experimental group was less than that of male students.

Table 2. Comparison of gurls and boys pupils for experimental group in the pre-exam

Pupils	N	Mean	Standard Deviation	Standard Error
Girls	6	20,83	4,91	2,00
Boys	14	20,35	3.07	0,82

As seen in Table 2 the scores of female and male students were found to be nearly the same. The female students' mean was 20.83, while male students' mean was 20.35. Standard deviation and mean were very important in showing that there was no difference. The standard deviations of female and

male students were 4.91 and 3.07, respectively. Thus no difference was found.

Curricular components included: (a) The chapter 'Heating and Cooling, Expansion and Contraction, Heat transfer' from 'Matter and Molecules'; (b) The software simulation from the yteach Internet site; (c) Interactive software that compares the simulation with particles.

'Heating and Cooling, Heat Transfer, Heat and Temperature': The development of 'Matter and Molecules' involved two cycles of research and development. It led to significant improvement in student learning although some difficulties remained (Lee et al., 1993). This unit takes account of students' prior knowledge, provides a wide variety of macroscopic experiences accompanied by molecular explanations and systematically guides student interpretation of their experiences.

Computerized simulation: 'yteach internet site'[3] consists of interactive software programs. This site includes 155 animations about Energy Resource and Energy Transfer in Key Stage 3. In addition, it includes animation of solids, liquids and gases and interactive programs. It shows 'particles' in the three phases of matter, and shows their constant motion and the interaction among them. In the interactions programs on this site, students are able to observe and track an individual particle in a variety of conditions (temperature, phases of matter, etc). In addition, students can modify parameters such as temperature and amount and observe the consequences of doing so. Students can make predictions and then observe what happens to the particles during heating, heat and temperature and contraction. Using the simulation, teachers can demonstrate various phenomena and provide (or ask students to provide) microscopic explanations. All particles in the simulation are round and seem identical, regardless of how the matter structure. In addition, particles of all substances appear as individual atoms and never as molecules. Upon observation, we noticed that the teachers in our study did not differ greatly

in the way they implemented computerized simulations. The three lessons that were selected were very structured which contributed to minimizing the differences. Each of the three lessons was accompanied by computerized worksheets that included questions guiding students' observations. Occasionally, students received feedback on their responses.

Comparison software: middle and high school students tend to see models as an actual copy of reality and not as conceptual representations (Grosslight et al., 1991). Involving students in considering which aspects of the actual phenomena are represented by the model and which are not may address this potential pitfall (Thagard, 1992; Harrison & Treagust, 1996; Gilbert et al., 1998; Justi & Gilbert 2002; Stern & Roseman 2004). With this in mind, comparison software was developed and used in our study. This interactive software (in the yteach site) attended to the differences between particles and their representation, in terms of size, velocity, shape, number of particles in a cubic centimeter and dimensions (the simulation is two-dimensional whereas particles are not).

Semi-structured personal interviews were designed to probe beyond students' initial responses. The interviews lasted approximately 60-65 minutes. A total of 37 students – 20 from the experimental group and 17 from the control group - were interviewed at the end of instruction. Those interviewed were chosen according to their score and responses to the post-test. The questionnaires that received the lowest scores typically included unanswered questions or responses that clearly indicated that the student did not understand anything in those lessons.

Results and discussion

The results are as follows (Tables 3 and 4):

Table 3. Average scores of pre-tests according to groups (95 % Confidence)

Pre-test	Experimental	Group	Control	Group
Total Score	Mean	Standard Deviation	Mean	Standard Deviation
70	20,50	3,60	18,82	6,25

t-test value: 1,018; p: 0,083; F-value: 3,18

Table 4. Average scores of post-tests according to groups (95 % Confidence)

Post-test	Experimental	Group	Control	Group
Total Score	Mean	Standard Deviation	Mean	Standard Deviation
60	45,50	5,60	31,76	12.86

t-test value: 4,33; p: 0,005; F-value: 8,99

Students in both groups did not display any significant difference until starting the study. So they were at the same level (Table 3). There were no significant gender related differences found in the first step (Stern et al., 2008).

The scoring system considered the total number of elements that were included in each answer. Each question was awarded 10 points in the pre-exam and post-exam, but sometimes, students didn't answer fully. In such cases, teachers gave half points or less to students' drawings. If students did not know anything, they were not given any points. All the students in the experimental and control groups improved their understanding of heat, heat energy and heat-temperature. The improvement was more substantial in the experimental group than in the control group.

Whereas the students in the experimental group improved their scores by 20,50 points on average, students in the control group gained only 18,82 points. There was no notable difference between these two groups. Further-more, the students in the experimental group scored significantly higher in the post-exam than the students in the control group. The pre-exam scores of students in both groups were found to be significantly different from the post-

exam scores using repeated measures ANOVA (F= 8,99, p= 0,005), indicating that both groups improved their scores (Table 4). However, their pre-exam results were not found to be significantly different as shown in Table 3 (F= 3,18, p= 0,083). In particular, their t values did not show any difference as seen in Table 3 (t= 1,018). Overall, a statistically significant variance was not found between the pre-exam scores of the control and experimental groups. However, both groups significantly improved their scores, though the improvement in the experimental group was significantly higher. Although the p value was 0,005 as shown in Table 4, we thought that the success of experimental group was significantly higher than that of control group. Also the experimental groups' mean score (45,50) was significantly higher than that of the control group (31,76). These results suggest that the use of computerized simulation improved understanding of energy, heat energy and heat-temperature among 6th graders, as was evidenced by their improved ability to apply this abstract idea where they answered the post-exam questions.

Interview analysis

During the interviews, students had the opportunity to clarify and elaborate on their own written responses and to apply energy, heat energy and heat-temperature in additional contexts. Generally, the ideas expressed by the students during the interviews concurred with the ideas that they had expressed in writing. As following (S: Student, I: Interviewer):

I: Which of the following amounts of heat are bigger – in a big bucket or in a glass?
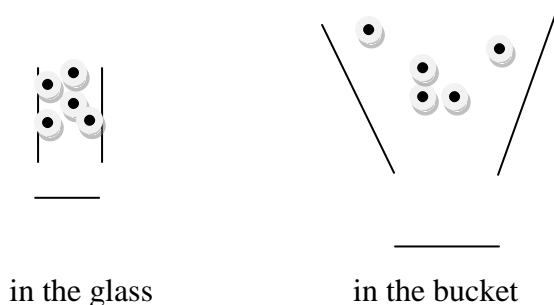
S: A glass

I: Why?

S: Because the grains of matter in glass are closer than those in a big bucket.

I: If the matter amount is small, are grains (molecules or atoms) closer? Can you draw it for me?

S: Yes.

I: Please, repeat it again on the computer

in the glass   in the bucket

● : grain of matter

Fig. 2. The drawings of control group on paint program of what they imagined in their minds

Fig. 2 shows what the control group imagined when they used paint program to draw their answer to the interview's question. The control group had some misconception following these exams because they had been taught using classical educational methods.

However, the experience of the experimental group was very different from the control group. See the interview below:

I: Which of the following heats the 'fastest' - air, water or key?

S: Is key made of a metal?
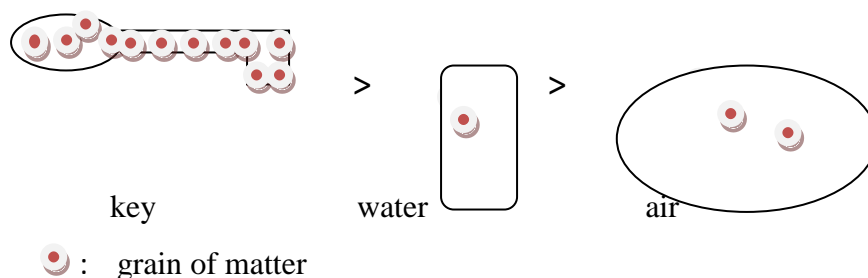
 I: Yes.

S: OK: key.

I: Why?

S: Because, the grains of a key are closer than those of the others.

I: Can you put the following in order?

S: Yes.

I: Please, repeat it again, draw it on the computer.

key   >   water   >   air

● :   grain of matter

Fig. 3. The drawings of experiment group on paint program of what they imagined in their minds

Fig. 3 shows what the experimental group imagined when they used paint program to draw their answer to the interview's questions. During the interview process, it was discovered that experimental group was more successful than the control group after having received computerized education.

Conclusion

In the study described in this paper, students who were provided with a molecular software simulation demonstrated significantly better understanding of the particulate model of matter than students who were not provided with this simulation. These results suggest that computerized simulation improved the understanding of the particulate nature of matter among our 6th graders. These findings are in accord with previous research, which showed that dynamic molecular animations, rather than static illustrations, could be powerful tools in promoting the learning of chemistry and physics concepts (Wu et al., 2001; Dori et al., 2003; Dori & Belcher, 2005).

Whereas this may seem encouraging, the achievements of both groups were very low. The average post-exam scores were approximately 46 for the experimental group and 32 for the control group. There were only 37 students available at the school (17 from the control group and 20 from the experimental group). The teachers reported that weeks later, the students from the experimental group explicitly referred to the computerized simulation several times, suggesting that these students may have retained ideas concerning matter, molecules and their motion, heat, the difference between heat and temperature better than the control group. In addition, the average score of the experimental group was higher than that of control group in the post-exam, although there was no notable difference between these two groups. Computerized education is not common in Turkey. In my opinion, students in the experimental group may have indeed remembered the unusual experience of working with interactive software but that this experience did not necessarily confer better learning in the long run.

Since the computerized simulation used in the study was not intended to be the only teaching tool but rather supplementary material, it is unlikely that this or any other supplementary software alone will be sufficient to promote meaningful learning. Computerized simulation is but one instructional strategy, and many studies conducted over the past few decades clearly show that the learning of abstract ideas in science requires the use of sound and diverse instructional strategies. Among these are the role of prior knowledge, the use of relevant phenomena for making scientific ideas plausible, conditions that facilitate the transfer of knowledge and the importance of guiding students' interpretation of their learning experiences (e.g., Lee et al., 1993; Smith et al., 1993; Kesidou & Roseman 2002). 'yTeach', a popular Internet site, was used in this study during the majority of curricular time devoted to the heat and heat energy and other issues. Whereas interactive programs and class activities from this site - a research-based unit that prescribes sound ped-

agogical strategies used in our study - teachers were not aware of the rationale for these strategies and only one chapter from this material was used throughout instruction. In conclusion, computerized education is better than classic educational methods.

NOTES

1.　　　Margel, H., Eylon, B. & Scherz, Z. (2011). A longitudinal study of junior high school students' perceptions of the particulate nature of matter. *Proceedings of the IOSTE symposium in Southern Europe,* Paralimni, Cyprus, 29 April – 2 May 2001.

2.　　　www.yteach.co.uk

3.　　　www.yTeach.co.uk

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UNDERSTANDING STRESS AMONG RETIREES OF HIGHER EDUCATIONAL INSTITUTIONS IN NIGERIA

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Abstract. This study examines the effect of stress on retirees. The study also identifies the cause of stress and strategies for reducing stress on retirees. The population of the study comprised 4000 male and female retirees of a Nigerian institution of higher learning. The sample of the study was 400 selected from the institution using simple random sampling technique. A questionnaire was used for data collection. Data collected were analyzed applying frequency counts and mean statistic. Findings revealed that standing for a long time can cause stress for retirees. The finding of the study also revealed that non-payment of gratuity and pension can cause stress for retirees. The findings of the study further showed eight strategies for reducing stress. Based on the findings recommendations were made.

Keywords: retirees, stress, higher institution of learning, Nigeria

Introduction

When a person is born, he/she undergoes series of changes from child-hood to old age. As a child, he/she is taken care of till he/she gets to a certain age when he takes care of himself/herself. As from the age of 65, a person attains old age and gradually moves to a period of dependence. If he/she is an employee of government, he/she will be retired one day.

Retirement (Blonna, 2005) is the period when a worker stops working either in public service or private service due to age or many years of service or voluntary. Employees in various organizations whether in government or the organized private sectors have a minimum numbers of years they can be in active employment. The retiring age differs from country to country. In Nigeria for example, Imhabekhai (1998) stated that as a result of the 1988 civil service reforms, the retirement age was 60 years or 35 years of active service. Recently, the Nigeria government increased the retirement age of an academic staff to 70 years and 35 years in service depending on the one that comes first.

Udoh (2001) simply defined stress as a pressure from outside that can make one feel tense inside. Selye (1976) referred to stress as a non-specific response of the body to any demand. This demand he contended may be pleasant or unpleasant and that in either case, the response of the body is the same. Udoh stated that a civil servant who just retired from service or is on the threshold of retirement or is retired prematurely generate a kind of feeling often manifested by a pounding heart, anxiety, apprehension and sometimes fear caused by change in their situations. Thus common signs of stress are nervousness, trembling, dimness, pounding heart, inability to slow down of relax, abnormal eating habits and troubled breathing.

Statement of the problem

It has been observed by the researchers that retirement from service for many workers evokes some stress. Gratuity payment and pension allowances

are often delayed by bureaucratic bottlenecks for several months or years. This often creates painful experiences to retiring offices who may a times are asked by the Federal Government to present themselves physically. The process which is known as "I am alive," The Federal government does this in order to fish out ghost retirees. These retirees come from different parts of the State and whenever they are asked to come, many of them stay under the scotching sun; some of them are on medication because of one ailment or the other. Such ailments may be hypertension, arthritis, diabetes, cancer of the lungs, severe cold and so on. Some of them face a lot of transport hazards because they have to travel down to show themselves. Exposing them into this type of stress could make them die before the collection of their pensions and gratuities. This study therefore looks into the study of stress on retirees of the Federal Universities Pension Association, University of Ibadan Chapter.

Purpose of study

The general purpose of the study is to look into the study of stress on retiree in the University of Ibadan Chapter of the Federal Universities Pension Association. Specifically, the paper sought to (1) determine the causes of stress on the retirees; (2) determine strategies for reducing stress on retirees.

Method

The design of the study was a descriptive survey design. The population of the study consisted of 4000 retirees both male and female in the University of Ibadan Chapter of the Federal Universities Pension Association (FUPA). The sample of the study was 400. Simple random sampling was used to select the sample. The instrument used was a structured questionnaire used for collecting data. The questionnaire was divided in three sections namely: Section A, Section B and Section C. Section A tapped the demographic variables about the respondents while section B consisted of statements relating to

the causes of stress and section C related to items on strategies for reducing stress on retirees. Their responses were elicited using a four point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The researchers went personally to the Ibadan during one of the retirees' meetings to collect data. The instrument was validated by two adult educators. The two experts were requested to validate the instrument in terms of: (1) Clarity of instruction to the respondents; (2) Proper wording of the items; (3) Appropriateness and adequacy of the items in addressing the purpose of the study. Their recommendations served as guide to modification of items in the instrument.

The reliability of the instrument was determined utilizing Crombach alpha method. The coefficient alphas for the three sections were 0.96, 0.96 and 0.96. These values indicate that the instrument was highly reliable. The method adopted for analyzing data include frequency counts and mean scores in respect of the research questions. Decision was taken. Any mean score of 2.5 and above was regarded as 'agreed' while those below 2.5 were regarded as 'disagreed.'

Results

Table 1 shows that 220 or 55% of the respondents were males while 180 or 45% were females. This showed that there were more males among the retirees than females.

Table 2 shows the responses of retirees on the causes of stress on them. In items 1 - 8 the mean scores are above the decision rule of 2.5. This means that the respondents agreed that all the items in the table cause stresses on them.

Table 3 presents the collective opinions of respondents used for the study. The collective opinions were decided by determining the mean opinion of the respondents on strategies for reducing stress on retirees. The respond-

ents agreed on items 9 - 14 as strategies for reducing stress on the retirees. This shows that there were no discrepancies in their opinions and this serves as a confirmation of the mean decisions.

Table 1. Distribution of respondents by sex

S\NO	Frequency	Percentage
Male	220	55
Female	180	100
Total	400	

Table 2. Mean responses of retirees on causes of stress on retirees

S\No	Items	SA	A	D	SD	Total	Mean	Decision
1.	Financial inse-curity	112 448	137 411	79 158	72 72	400 1089	2.72	Agree
2.	Standing for a long period of time	94 376	232 696	51 102	23 23	400 1197	2.99	Agree
3.	Excessive travelling	137 548	158 474	81 162	24 24	400 1208	3.02	Agree
4.	Sickness such as hypenten-sion, diabetes, cancer, hepati-tis etc	156 624	148 444	77 154	19 19	400 1241	3.10	Agree
5.	Retirement from service	192 768	131 393	62 124	15 15	400 1300	3.25	Agree
6.	Death of a family member	114 456	123 369	13 26	153 153	400 1004	2.51	Agree
7.	Non-payment of gratuity and pension	205 820	125 375	20 40	50 50	400 1285	3.21	Agree
8.	Unable to cope with the new situation of retirement	143 572	165 495	51 102	41 41	400 1210	3.20	Agree

Table 3. Response of the respondents on strategies for reducing stress on retirees

S\No		Items	SA	A	D	SD	Total	Mean	Decision
9		Planning for future	191 764	132 39	60 120	18 18	400 1298	3.25	Agree
10.		Saving\investment	137 411	112 448	79 158	72 72	400 1089	2.72	Agree
11.		Retirement Education	114 456	123 369	13 26	153 153	400 1004	2.51	Agree
12.		Having leisure time	140 560	134 402	99 198	27 27	400 1187	2.97	Agree
13.	Playing indoors games		165 660	100 300	87 174	48 48	400 1182	2.96	Agree
14.	Prompt payment of pension and gratuity		192 768	131 393	62 124	15 15	400 1300	3.25	Agree
15.	Exercise		114 456	123 369	13 26	153 153	400 1004	2.51	Agree
16.	Eating balanced diet		205 820	125 375	20 40	50 50	400 1285	3.21	Agree

Summary of findings

The summary of the findings can be presented as: (1) The causes of stress are financial problems, excessive travelling, non-payment of gratuity and pension, unable to cope with the new situation of retirement, and death of a family member; (2) Strategies for reducing stress are planning for the future, saving\investment, retirement education, having leisure time, playing indoor games and prompt payment of pension.

Discussion

The findings of the study revealed that changes in life's circumstances cause stress in today's society. This view corroborates with Channing L. Bets Co.,[1] who opined that such changes in life circumstances can cause stress especially when they are sudden or disagreeable. According to Udoh (2001),

the causes of stress are limitless. They pointed out that personal loss, financial insecurity, strained working conditions, insurmountable bills to pay, broken engagement, an unhappy marriage, death of a family member, jobs changes, illness\injury, changes in life style and retirement impose a tremendous amount of stress on people. The findings of the study also revealed that excessive travelling and standing for a long period of time cause stress on retirees. This view supports Udoh (2001) who stated that excessive travelling and long hours of work caused by stress may result in anxiety and depression. The findings of the study showed that retirement from service, non-payment of gratuity and pension, illness are some of the factors causing stress on retirees. The findings of the study corroborates Udoh (2001) who stated that reduced pension or gratuity which is paid very late or never paid at all impose tremendous stress on retirees. Many of the retirees die of stress emanating from being unable to adapt or cope with their new situation.

The findings of the study showed some strategies for reducing stress on the retirees. These strategies involved planning for the future. Many of the respondents agreed that planning for the future will reduce stress on the retirees. Many people are ill prepared for retirement even when they see it coming. Most people forget that what is expected to happen tomorrow has to be planned for today. Planning for retirement is thus important for a good plan will greatly reduce the amount of stress. The question arises. How would the retirees plan before the retirement comes? A good planner would start by looking for some things to do in future today. The planning could start today and not tomorrow. Planning for the future would make the retirees to be self-reliant and idle. Retirees could think of establishing extra mural schools, private primary and secondary schools, vocational centres, investing in agriculture and so on. Retirees could then start saving or investing their money in reputable banks. By the time they retiree, they would have something tangible to fall on instead of having stress.

The findings of the study also revealed that retirement education is one of the strategies of reducing stress on the retirees. This findings supports Imhabekhai (1998) who stated that retirement education involves making several opportunities available to retirees. It may involve vocational skill acquisition which includes the provision of vocational skills that will equip the retired officers for self-employment. This will enable retirees to earn additional income to offset the reduction in income brought about by retirement. Imhabekhai (1998) also highlighted that retirement education provides courses on how to establish and effectively managed small scale business enterprises. Retirement education helps retirees to make active use of their retirement life rather than wasting away their valuable time. The boredom of staying idle at home can be very nostalgic to retired people who are not gainfully engaged. Active employment after retirement can help to increase the individual's life span.

The findings of the study further revealed that having leisure time and provision of indoor games could reduce stress on the retirees. This finding is in support of the view of Omolewa (1981) and Imhabekhai (1998) who stated that games are essentially means of relaxation, some can be used in teaching some skills and attitude. Games also can be used to reinforce cognitive learning. Imhabekhai (1998) listed some games which could be useful for learners. These included scrabble, monopoly, and chess game. Scrabble can be used in teaching word power or vocabulary development. Monopoly is used in teaching investment. Chess game is used in teaching hierarchy of authority in administration and defense/war programmes. Playing these games in leisure periods could reduce stress on the retirees.

The findings of the study further showed that prompt payment of pension and gratuity could reduce stress on the retirees. This finding corroborates the view of Udoh (2001) who stated that prompt payment of pension and gratuity can reduce stress on the retirees.

Furthermore, the findings of the study revealed that exercise and eating balanced diet could reduce stress on retirees. This finding further supports Udoh (2001) who stated that exercise is good for relaxing that uptight feeling. Walking, jogging, cycling or any favourite sport or form of physical exertion will help to let off steams and walk out stress. Delano (1999) also asserted that balanced diet ensures healthy life.

Conclusion and recommendations

Stress appears to be very common in today's society. Stress can make us unhappy, depressed and miserable. They situation can be hard on retirees because they are old people. If the condition is not treated on time, stress could lead to anxiety, tension and even death. Stress and the problems they cause can be cured. Prompt and correct treatment can help most persons to return to normal life. Retirees could last longer if they could plan well and invest in their future.

Based on the findings of this study, the following recommendations can be made: (i) The Federal government of Nigeria should try as much as possible to pay up the gratuity and pension allowances of their retirees on time; (ii) The retirees should not wait till the time they are retired before they plan. They should start planning for the future immediately they are employed as civil servants; (iii) Conducive environment for the retirees whenever they come for physical appearance should be provided by the Federal government (iv) Retirees should also endeavor to take some exercises that could make them strong; (v) Retirees should eat balanced diet and take enough fruits that could give them enough nutrients in the body.

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1. http://www.channing-bete.com/

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THE ROLE OF FOUNDATION UNIVERSITIES IN THE HIGHER EDUCATION POLICIES AFTER 1980[1)]

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Abstract. The higher education system which entered a new period with the 1980s has in the last five years entered a phase of numerical enlargement and structural transformation. Having only 19 public universities in the early 1980s, the higher education system today have turned into a broad system with 85 public and 30 foundation universities. The research aims to discuss the role of foundation universities in the higher education policies implemented between the years 1980-2007. Among the five development plans prepared between 1980 and 2008, it was suggested for the first time with the sixth five-year development plan that foundations should be supported to establish private universities and policies was formulated accordingly. Mesut Yılmaz was the prime minister and Süleyman Demirel was the president who opened the highest number of foundation universities between 1980 and 2008. While the number of students between 1986-1987 was 426 in foundation universities, this number in foundation universities reached 109.903 in the 2006-

2007 academic year. The annual growth rate of the number of students in foundation universities within the twenty-year period is 32%. In the 2006-2007 academic year, the number of academic staff in foundation universities is 7766, of academic fellows is 2502, and of students is 109,903. The number of students per academic staff in foundation universities in the 2006-2007 academic year is 21, whereas the number of students per academic fellow is 44.

Introduction

Though the functions expected from higher education institutions bunch up in various areas; they have such functions as to provide general education following secondary schooling, to deal with science and technology, to meet the human requirement of the economy, and to support development of productivity for a stronger competition. The functions expected from higher education bodies can be clustered as education, production of scientific knowledge, research and social service. It is observed that the number of public and foundation universities rose with the 1980s in order to perform these functions.

Having entered a new period with the 1980s, the higher education system has in the last five years entered a phase of numerical enlargement and structural transformation. Having only 19 public universities in the early 1980s, the higher education system today have turned into a broad system with 85 public and 30 foundation universities. While the number of universities at the beginning of the 1980s was 19, this number has risen six times to 115 in the last quarter century. This increase displays a numerically considerable enlargement in the higher education system. The number of foundation universities, the first of which was established in 1984, increased thirty times

and reached 30 in the year 2008. Therefore the higher education entered a dual structure and a transformation process with both public and foundation universities. The number of foundation universities rose in 1984 from 1 to 3 in 1993, to 8 in 1996, to 15 in 1997, to 20 in 1999, to 25 in 2006 and to 30 as of May 2007.

As of the 1980s, Turkey has been experiencing a structural transformation process, the effects of which are increasingly continuing in social and economic policies. The structural transformation process in economic and social policies triggered by globalization aims the withdrawal of the state from public spheres where it operates, curtailing public expenditures in the budget, making legal arrangements in favor of the private sector, lifting the financial limitations to ensure that the domestic market integrates with the world markets, reducing production costs and increasing productivity. The structural transformation process in social policies started also to affect educational policies. The increase in the number of foundation universities in this period can be related to the neoliberal policies implemented such as the withdrawal of the state from public spheres where it operates, curtailing public expenditures in the budget, making legal arrangements in favor of the private sector, lifting the financial limitations to ensure that the domestic market integrates with the world markets, reducing production costs and increasing productivity.

Real or legal persons in Turkey cannot establish for-profit universities in Turkey. Private higher education institutions can be established by foundations only if they secure certain conditions. The legal framework what relates to the establishment of higher education institutions owned by foundations is shaped by the Constitution, Higher Education Law and the Regulation on Foundation Higher Education Institutions.

Funding foundation universities basically consists both of the revenues of the establishing foundation and the educational fees received from the students. Foundation universities can receive a share from the general budget

provided that they express their demand and ensure certain conditions. There exist some such additional conditions for government assistance to foundation higher education institutions as that these institutions have completed minimum two academic years and that they provide full scholarships to minimum 15% of their students which covers all educational expenditures of these students.[2] The private higher education institutions to be established by foundations also benefit from the financial conveniences, exemptions and derogations that are to be found in Article 56 of the Law No 2547. These institutions are exempted from property tax.

Higher education in Turkey is a public service according to the Article 130 of the Constitution. The higher education has, however, a mixed funding model. That the utility from higher education expresses more of an individual utility rather than a social one is given as the rationale for the mixed funding model implemented. The rationale for the currently-implemented mixed funding model is explained in the Seventh Five-Year Development Plan. The Seventh Five-Year Development Plan emphasizes the principle that the state must take on the costs of the mandatory education where societal utility is considerable, whereas it states that the funding model for higher education is based on the principle that the beneficiaries of higher education, which provides more of an individual utility, must pay for the cost of the service. The publication of OECD titled "Analysis of the Educational Policy in Higher Education (2005-2006)" indicates that the biggest problematic that requires debating in the formulation of robust policies towards internationalization of higher education is the answer to the question of who should pay the cost of higher education.

Another development that accelerated the privatization efforts in higher education besides the mixed funding model is the propensity to leave universities alone with the resources they produce/will produce by curtailing of the resources in the budget allocated to public universities. The "Turkish

Higher Education Strategy" – a report prepared by YOK (Higher Education Institution) in 2007 demonstrates that the proportion of the budget in the revenue resources of the universities was 80% in late 1980s, while this proportion has been reduced to 57% according to 2005 data. The circulating capital revenues of public universities in the 1990s were 20% of the general budget, while this number increased time times to 40% in 2005. This change observed in budget numbers is a numerical reflection based on the neoliberal policies implemented of the efforts of the state to withdraw from such public spheres as education and to eviscerate the public service nature of higher education which is specified accordingly in the Constitution.

The allocated to higher education shrinking resources by the government is, according to Lee (2002), also a reflection of the globalization policies on the higher education system. The reduced ratio of public resources in university budgets has compelled universities to create their own resources; and thus rather than disseminating the knowledge they produce, they started to approach knowledge as a commodity which can be presented and sold in the market. Consequently, the market has become the determining power that specifies which courses should be provided, which program is to be closed or opened, and which research will be supported. For instance, the department of philosophy is struggling for survival with 80 students in only four foundation universities out of the 30.

There are positive and negative views regarding foundation universities. According to the former rector of Bogazici University Üstün Ergüder, foundation universities opened up the way to competition among universities; and thus the non-profit foundation university model in Turkey, argues Ergüder, is one which should be taken as an example by many European Union member states.

Önder (2000) on the other hand maintains that foundation universities have two objectives. The first of these is to transfer academic staff from state

universities by paying their own academic staff considerably higher from that in state universities. Bearing no costs of educating their academic staff by themselves, foundation universities try to sustain their programs by obtaining staff both from public universities and from abroad. The second and fundamental objective of foundation universities is to conceptualize and secure the ideology of capital and to disseminate this to new generations; they thus ensure the constant operation of the system training their staff in line with their own ideology. The conclusion text of the meeting entitled "The Trend to Privatization in Higher Education: Basic Problems, Approaches and Perspectives," organized by Friedrich Ebert Foundation in 2000, states that the aim of foundation higher education institutions is to educate staff who are adaptable to the system.

As of the 1980s, Turkey was introduced the foundation universities that are constantly debated. Establishment of foundation universities has been encouraged in Turkey in order to educate more students of a broader age group in the higher education system, to ensure mass education, to meet the labor requirement of the economy, to accelerate production of knowledge and research, and to ensure the globalization of higher education, and their number constantly increased with the 1990s. The problematic of this research is to discuss the role of foundation universities in the higher education policies implemented in Turkey between the years of 1980 and 2007.

This research aims to demonstrate the role of foundation universities in the higher education policies implemented in Turkey between the years of 1980 and 2007. In this framework, the answers to the following questions have been sought: (1) what were the policies regarding foundation universities in the Development Plans and government programs? And (2) how did the number of students and academic staff of the foundation universities increase?

The research has employed scanning model. Therefore, having substantial influence on formulation of higher education policies between 1980

and 2007; development plans, government programs, laws and documents prepared for foundation universities have been scanned. In this context; the number of foundation universities, developments in the number of their staff and students from 1980 up to today will be examined so as to demonstrate the role of foundation universities in the Higher Education System in Turkey.

Foundation universities in development plans

This part of the research deals with the sections in the development plans that were prepared after 1980 on foundation universities. Five development plans were prepared following 1980 and four of them were implemented. The development plans that were prepared between the years of 1980 and 2007 are as follows:

1. 5th Five-Year Development Plan   (1985-1989)
2. 6th Five-Year Development Plan   (1990-1994)
3. 7th Five-Year Development Plan   (1996-2000)
4. 8th Five-Year Development Plan   (2001-2005)
5. 9th Five-Year Development Plan   (2007-2013)

Below are there provisions in the development plans that encourage foundation universities and the private sector to become involved in the higher education system.

Fifth Five-Year Development Plan (1985-1989)

The 5th Five-Year Development Plan emphasizes (1985-1989) that universities will give equal emphasis to such functions as to educate community leaders through scientific research, that it will be encouraged to educate students in close connection to production via the circulating capital, and that arrangements will be made which will promote the relations of universities with the environment and industry.

The emphasis in the plan on effective operation of university circulat-

ing capitals and on making arrangements that will promote environment-industry relations of universities evoke neoliberal ideas on higher education policy and finance.

Sixth Five-Year Development Plan (1990-1994)

The Sixth Five-Year Development Plan (1990-1994) stresses that social demand will also be considered besides labor requirements in capacity building efforts for higher education, that support will be derived from resources outside the budget by developing the funding structure of higher education, and that legal, economic and structural arrangements will be developed that will promote university-industry relations.

The plan states that universities will hold practical educational programs, and that master's thesis subjects will be encouraged to be in line with the requirements of the industry. That the development plan highlights it will be encouraged that masters theses be prepared in accordance with the requirements of the industrial sector can be interpreted as the determination of the research agenda of universities by the market.

That foundations will be encouraged to establish private universities and policies will be formulated accordingly is mentioned for the first time in the Sixth Five-Year Development Plan. It is highlighted in the plan that foundations will be encouraged to establish private universities and that the private sector will be supported accordingly.

Seventh Five-Year Development Plan (1996-2000)

The Seventh Five-Year Development Plan (1996-2000) indicates that new arrangements are required to ensure that, except for mandatory education, service beneficiaries of any level contribute to the financing of education proportionate to their financial capacities, and to increase the number of private educational institutions at every level of education; whilst the plan also points

out that the funding model will be based on the principle that the state must take on the costs of the mandatory education where societal utility is considerable, and on the principle that the beneficiaries of higher education, which provides more of an individual utility, must pay for the cost of the service. With this principle, it is pointed out that the mixed model in financing higher education will be a permanent funding policy.

The plan notes that educational service provision by the private sector under the supervision of the government will be encouraged, while establishment of private universities or high schools by the private sector other than foundations will also be supported. It is also remarked in the plan that the legal provisions that bar the establishment of universities and high schools by the private sector (YOK Law No 2547 and Article 130 of the Constitution) will be changed accordingly.

Eighth Five-Year Development Plan (2001-2005)

The Eighth Five-Year Development Plan (2001-2005) emphasizes that initiatives will be taken to ensure contribution of local governments, voluntary organizations and the private sector besides the central government to make education widespread.

The plan states that the higher education system will be relieved from the bureaucratic and centralist structure, and that new legal arrangements will be made that will promote competition in the system. It also notes that funding resources will be diversified, and that the contributory fees to be received from students will be one of the resources in funding higher education.

The plan indicates that the university-industry cooperation could not be secured in the previous plans, and that the necessary initiatives will be made to incorporate the private sector more in education.

The Eighth Five-Year Development Plan is important in that the globalization policies are more clearly to be observed. The expressions which

point out that the private sector will be supported in education, legal arrangements will be made to promote competition in higher education, and that funding resources will be diversified can be interpreted as examples of the globalization policies.

The plan also emphasizes that the industrial sector should not only contribute to education by investing in foundation universities, but also by sponsoring the academic staff of public universities. With this principle, the plan is significant in that it tries to form a mixed funding model by incorporating also the private sector in funding public universities.

Ninth Five-Year Development Plan (2007-2013)

The plan emphasizes that the special resources allocated to education will be channeled so as to ensure equality of opportunity in education, the share of the private sector will be increased in all levels of education, and that it will be made possible to establish private higher education institutions provided that an effective quality assessment and supervision system be set up. Emphasizing that the share of the private sector in all levels of education will be increased during the period of the plan, the plan shows that the influence of neoliberal policies implemented after 1980s will continue on educational policies.

Among the five development plans prepared between 1980 and 2008, it is mentioned for the first time in the sixth five-year development plan that foundations will be encouraged to establish private universities and that policies will be formulated accordingly. The highest number of foundation universities was opened during the seventh five-year development plan. 17 foundation universities were opened during the period of the seventh five-year development plan which covered the years between 1996 and 2000.

Foundation universities in government programs

This section discusses the governments, which came to power after 1980, that formulated policies on foundation universities in their government policies. These governments are as follows:[3]

The 1st Özal government (13.12.1983 - 21.12.1987) program though emphasizes that education is one of the fundamental responsibilities of the state, it states that legal arrangements will be made to ensure that individuals and private institutions deliver educational services. The 1st Özal government program is significant in that it indicates that it will also open the public service field to the private sector just as education.

The 1st Mesut Yılmaz government (23.6.1991 - 20.11.1991) program indicates that the private sector, legal persons like foundations and associations, philanthropists will be encouraged and supported to establish formal educational institutions from pre-schooling institutions to universities.

The 1st Tansu Çiller government (25.6.1993 - 5.10.1995) program states that the private sector continue to be encouraged to invest in health and education by providing the necessary tax reliefs and cuts via financial sector and capital market reforms; and the plan also indicates that legal arrangements will be made to ensure that the land requirement of private investors for their investments in health and education will be met by providing them with public lands. The 1st Tansu Çiller government program is distinguished from the other government programs in that it explicates how the private sector will be encouraged and supported to invest in education (tax reliefs, meeting the land requirement of foundation universities by public lands). The policy implementations of the 1st Tansu Çiller government program regarding the provision that opens up the way to meet the land requirement of foundation universities by public lands created intense controversy in the public.

The 2nd Mesut Yılmaz (6.3.1996 - 28.6.1996) and the 3rd Mesut Yılmaz government (30.6.1997-11.01.1999) programs state that establishment

of foundation universities will be promoted. It is emphasized that by encouraging the private sector to open schools and foundations to open private universities, it is intended to ensure that these sectors take up more role in development of education, technical methods and technologies and in production of educational tools and materials. It is also pointed out in the plan that necessary legal arrangements will be made to establish private universities.

The Necmettin Erbakan government (28.6.1996 - 30.6.1997) program states that the private sector will be encouraged to establish private universities by making the necessary legal arrangements.

The 1st Abdullah Gül government (18.11.2002 - 14.3.2003) program states that, parallel to the change in the management concept in the world, a governance-oriented and democratic approach will be employed in education by receiving the initiative and participation of local governments, private sector and civil society organizations in formulation of educational policies and in service delivery. The program also emphasizes that the private initiative will be supported and encouraged in every aspect of education, and that their share in education will thus be increased.

Studying the parliament minutes regarding the five foundation universities that were opened in 2007, the comments of the MP speaking on behalf of the Justice and Development Party (AKP) are significant in that they reflect the perspective of the governments that came to power after 1980 on foundation universities. The speech of the MP is directly quoted below:

> [T]oday, 95.4% of our students that study in higher education institutions attend public universities, and only 4.6% of them study in foundation universities. This rate is considerably low for our country and all the burden is carried by the state. For instance, I would like to provide some examples; the share of foundation universities in Japan is 81% among the higher education institutions. It is 74% in Korea, 26& in the USA, and even in the lowest example 10% in Switzerland. It is no way below the rate of 10% in any of the European countries. Therefore, any investment, any initiative, any new brick on the wall in this field is significant in enlightenment of our youth. Consequently, we support these initiatives as the Government and the AK Party group and thank in advance everyone who will establish this

type of foundation universities. **May God bless them**, because this country needs enlightened brains, enlightened people, educated people. We show our deepest respects to anyone who make their efforts accordingly (AKP MP, Alaatin Büyükkaya, MP in the 22nd Period)

The prime minister who witnessed the establishment of the highest number of foundation universities among the governments that came to power after 1980 was Mesut Yılmaz. The governments of Mesut Yılmaz's prime ministry ratified the legal arrangements that opened up the way to the establishment of 15 foundation universities. 5 foundation universities were established during the 2nd Mesut Yılmaz government with Mesut Yılmaz as the prime minister, and 10 were opened during the 3rd Mesut Yılmaz government. Table 1 presents information as to which foundation universities were established during which government.

It is observed in the graphic that it is the period of Mesut Yılmaz government between 1996 and 1998 when the highest number of foundation universities were opened. Fifteen foundation universities were opened up in this period. In other words, half of the foundation universities were established during the period when Mesut Yılmaz was the prime minister. Prime Minister Recep Tayyip Erdoğan follows Mesut Yılmaz in terms of the number of foundation universities opening up. 7 foundation universities were opened up during the period between 2003 and 2007 when Recep Tayyip Erdoğan was the prime minister. Among the presidents, the 9th president Süleyman Demirel was the one who approved the highest number of laws on establishment of foundation universities. Today (2008), there are 30 foundation universities within the Turkish higher education system. Süleyman Demirel signed the laws of the seventeen out of the thirty foundation universities. Süleyman Demirel also opened a foundation university during his prime ministry.

Table 1. Governments and presidents approving establishment of   foundation universities

Name	Year	Government Period and Prime Minister	President that Approved	No of Universities Established
Bilkent University	1984	1st Özal Government. Turgut ÖZAL	Kenan EVREN	1
Koç University	1991	7th Demirel Government. Süleyman DEMİREL	Turgut ÖZAL	1
Başkent University	1994	1st Çiller Government. Tansu ÇİLLER	Süleyman DEMİREL	1
Yeditepe, Sabancı, Fatih, Işık, Bilgi, Kültür, Kadir Has, Beykent, Maltepe, Atılım, Çankaya, Çağ, Doğuş, Bahçeşehir, Haliç University	1996–1997-1998	2nd and 3rd Yılmaz Governments. Mesut YILMAZ	Süleyman DEMİREL	15
Ufuk, Okan, Ekonomi, Yaşar and Ticaret University	1999-2001	4th and 5th Ecevit Governments. Bülent ECEVİT	Süleyman DEMİREL (2) Ahmet Necdet SEZER (3)	5

Number of foundation universities (1984-2008)

Higher education is delivered by private institutions in various ways. The model which is practiced in Turkey is a non-profit foundation university model. Turkish higher education was introduced with her first foundation university in 1984. In the year 2008, 30 foundation universities deliver higher education service in Turkey. Graphic 2 presents the years of establishment of foundation universities that opened up between 1984 and 2007.
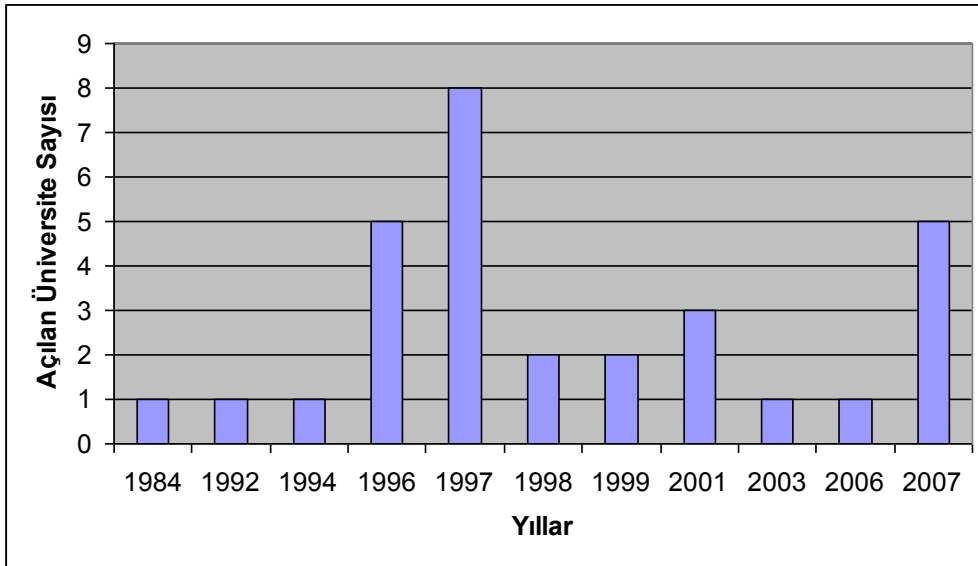
Table 2. Years of establishment of foundation universities (1984-2007)

Name of University	Year of establishment	Place of establishment
1. Bilkent University	1984	Ankara
2. Koç University	1991	İstanbul

3. Başkent University	1994	Ankara
4. Yeditepe University	1996	İstanbul
5. Sabancı University	1996	İstanbul
6. İstanbul Bilgi University	1996	İstanbul
7. Fatih University	1996	İstanbul
8. Işık University	1996	İstanbul
9. İstanbul Kültür University	1997	İstanbul
10. Kadir Has University	1997	İstanbul
11. Beykent University	1997	İstanbul
12. Maltepe University	1997	İstanbul
13. Atılım University	1997	Ankara
14. Çankaya University	1997	Ankara
15. Çağ University	1997	Mersin
16. Doğuş University	1997	İstanbul
17. Bahçeşehir University	1998	İstanbul
18. Haliç University	1998	İstanbul
19. Ufuk University	1999	Ankara
20. Okan University	1999	İstanbul
21. İzmir Ekonomi University	2001	İzmir
22. İstanbul Ticaret University	2001	İstanbul
23. Yaşar University	2001	İzmir
24. TOBB Economy and Technical University	2003	Ankara
25. İstanbul Science University	2006	İstanbul
26. İstanbul Arel University	2007	İstanbul
27. İstanbul Aydın University	2007	İstanbul
28. Acıbadem University	2007	İstanbul
29. İstanbul Özyeğin University	2007	İstanbul
30. İzmir University	2007	İzmir

It is observed in the graphic; having been 1 in 1984, the number of foundation universities rose to 3 at the end of 1994, to 8 in 1996, to 16 in 1997, to 20 in 1999, to 25 in 2006, and to 30 as of May 2007. The highest number of foundation universities was opened up in 1997 between the years of 1984 and 2007. Eight foundation universities were opened in 1997. ıt is also seen in the graphic that almost all of the foundation universities are located in the three big cities. Only Çağ University is located in Mersin. 20 of the

foundation universities are located in Istanbul'da, while 6 are in Ankara, and 3 are in Izmir. Fig. 1 presents the years of establishment of the foundation universities that opened up between 1984 and 2007.

Fig. 1. Years of establishment of foundation universities
(1984-2007)

It is observed in the figure that only one foundation university was opened in the decade between 1980 and 1990, while 22 were opened during the period between 1991 and 2001. 22 of the current 30, in other words 74% of the foundation universities in 2007 were established between the years 1991 and 2001.

Change in number of students in foundation universities (1986 - 2007)

The legal framework regarding establishment of private higher education institutions owned by foundations was shaped by the Constitution, YOK Law and the Regulation on Foundation Higher Education Institutions. The first foundation university was opened in 1984 under the name of Bilkent

University. Student quota for foundations is determined by YOK, and higher education institutions face the same rules with public universities in this regard. Table 3 presents the change in number of students in foundation universities.
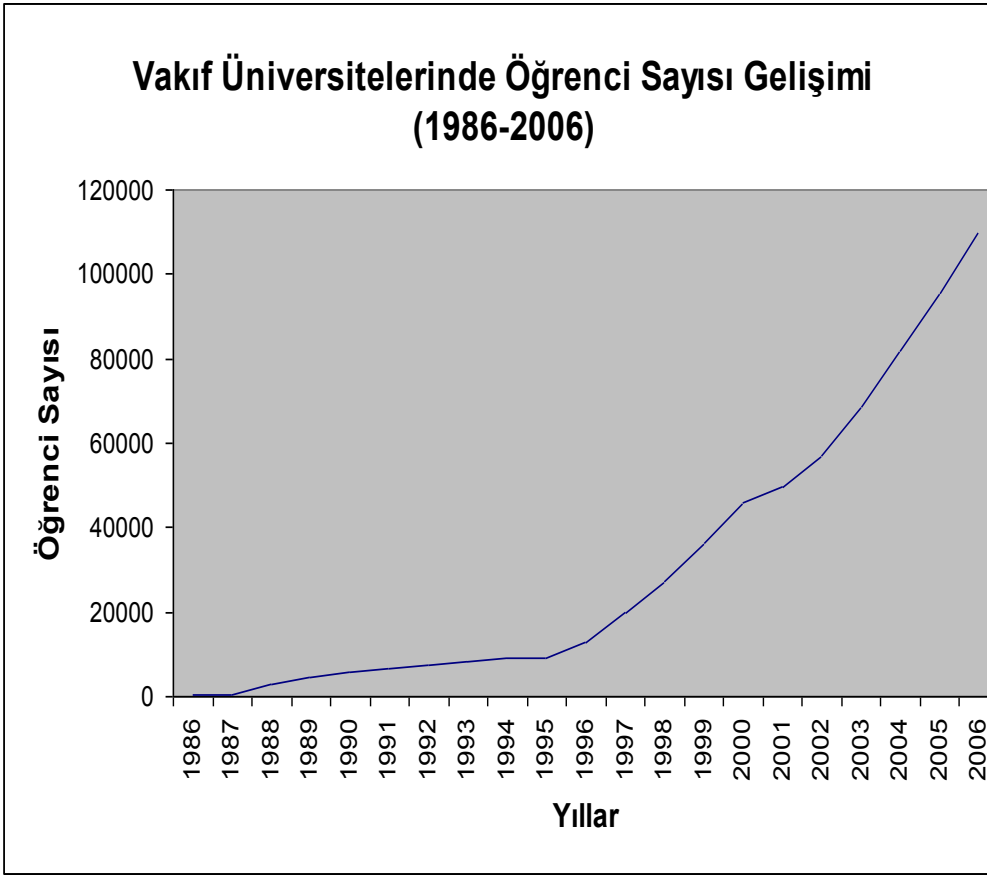
Table 3. Change in number of students in foundation universities (1986-2006)

Academic year	No. of students	No of Universities
1986-1987	426	1
1987-1988	301	1
1988-1989	3088	1
1989-1990	4374	1
1990-1991	5846	1
1991-1992	6740	1
1992-1993	7486	3
1993-1994	8464	3
1994-1995	9063	3
1995-1996	9103	3
1996-1997	12646	8
1997-1998	19998	15
1998-1999	27367	18
1999-2000	36244	20
2000-2001	46022	20
2001-2002	49510	23
2002-2003	57213	23
2003-2004	68684	24
2004-2005	81794	24
2005-2006	95782	24
2006-2007	109903	25

Source: OSYM Statistics (2007), Developments in Higher Education (1989), Foundation Universities Report (2007).

It is observed in the Table 3 that the number of students that was 426 between in the 1986-1987 academic year reached 109903 in 25 foundation universities in the 2006-2007 academic year. The annual increase rate of students in foundation universities during the twenty-year period has been 32%. The numerical development in the number

of students in foundation universities is presented in Fig. 2.

Vakıf Üniversitelerinde Öğrenci Sayısı Gelişimi (1986-2006)

Fig. 2. Change in number of students in foundation universities

This figure shows that the number of students in foundation universities displayed a dramatic increase with 1996. Twenty-two of the now-operating thirty foundation universities were opened up during this five-year period covering 1996 and 2001. In other words, 70% of the established foundation universities were opened between 1996 and 2001. Table 4 presents the proportion of foundation university students within the overall number of university students.

Table 4. Number of students of foundation universities and the number of students of public universities

Academic Year	Number of Foundation University Students, a	Number of Public University Students	Total, b	a/b (%)
1986-1987	426	481174	481600	0.09
1987-1988	301	495101	495402	0.06
1988-1989	3088	548630	551718	0.56
1989-1990	4374	631455	635829	0.69
1990-1991	5846	689864	695710	0.84
1991-1992	6740	742110	748850	0.90
1992-1993	7486	841334	848820	0.88
1993-1994	8464	1063848	1072312	0.79
1994-1995	9063	1087007	1096070	0.83
1995-1996	9103	1141034	1150137	0.79
1996-1997	12646	1200519	1213165	1.04
1997-1998	19998	1302357	1322345	1.51
1998-1999	27367	1347090	1374457	1.99
1999-2000	36244	1376004	1412248	2.57
2000-2001	46022	1454209	1500231	3.07
2001-2002	49510	1510528	1560038	3.17
2002-2003	57213	1722518	1779731	3.21
2003-2004	68684	1752297	1820994	3.77
2004-2005	81794	1859253	1942995	4.21
2005-2006	95782	2055973	2155170	4.44
2006-2007	109903	2155033	2264936	4.85

Source: OSYM Statistics (2007), Developments in Higher Education (1989), Foundation Universities Report (2007).

The Table shows that the proportion of foundation university students among the overall number of university students was 0.09% in the 1986-1987 academic year, whereas this proportion rose to 4.85% in the 2006-2007 academic year. Although the number of students enrolled in the foundation universities rose to 5 per cent of the overall university students, it is far from reaching the numbers in some countries. According to the OECD data, the ratio of students enrolled in private higher educa-

tion institutions constantly increase. While the ratio of those enrolled in private higher education institutions in 1985 was 18% in the world in general, this ratio reached 30% in 2006 (OECD, 2006; YOK,2007).

Change in number of academic staff in foundation universities (1987-2006)

One of the most important factors that affect the quality of education in universities is the academic staff. Both the quality and quantity of the academic staff affect the quality of education either positively or negatively. One of the criteria that shows the quality of education regarding the academic staff is the proportion of academic fellows among the academic staff, and the other is the number of students per academic fellow. In the 2006-2007 academic year, there are 7766 academic staff and 2502 academic fellows that work in the foundation universities and the number of students enrolled is 109,903. While there are 21 students per academic staff in the 2006-2007 academic year in the foundation universities, this number is 44 students per academic fellow. The high number of students per academic fellows affects the quality of education in a negative way. It is observed that this number differs between 15 and 25 in the higher education institutions of the developed countries. In the public universities this number is 44 students per academic staff, and 67 students per academic fellows in the 2006-2007 academic year. Table 5 presents the development of the number of academic staff in foundation universities between 1987 and 2006.

Table 5. Change in number of academic staff in foundation universities (1987-2006)

Year	Total Number of Academic Staff	Total Number of Academic Fellows	Number of Academic Staff (Lecturer, Research Assist.)	Total Academic Staff / Academic Fellows (%)
1987	67	22	45	32.8
1988	169	36	133	21.3
1989	181	39	142	21.5
1990	356	74	282	20.8
1991	442	90	352	20.4
1992	541	108	433	20.0
1993	641	128	513	20.0
1994	729	160	569	21.9
1995	906	197	709	21.7
1996	1055	219	836	20.7
1997	1346	321	1025	23.8
1998	1860	479	1381	25.7
1999	2624	588	2036	22.4
2000	3427	882	2545	25.7
2001	3721	1017	2704	27.3
2002	4601	1411	3190	30.7
2003	4900	1588	3312	32.4
2004	5646	1804	3842	32.0
2005	6780	2162	4618	31.9
2006	7766	2502	5264	32.2

It is observed in Table 5 that the number of academic staff that was 45 in 1987 in foundation universities (lecturers, research assistants) rose to 5264 by a 28% increase in the year 2006. The number of academic fellows that was 22 during the same period in 1987 reached 2502 by a 28% increase in the year 2006. The number of academic staff and academic fellows in foundation universities between the years of 1987 and 2006, in other words, displays a parallel annual increase rate.

Whereas the proportion of academic fellows amongst academic staff was 32.8% in 1987, as can be observed in the graphic, this proportion is still almost the same in 2006 (32.6%). This finding demonstrates that, in the two decades, the foundation universities could not implement policies that were required to increase the number of and to educate academic fellows and in academic fellows.

That foundation universities minimize the cost of educating their own academic fellows by transferring already-educated academic fellows from public universities is criticized in the literature. Önder (2000) maintains that foundation universities obtain academic staff from public universities by paying them considerably higher than public universities do. Bearing no cost of educating academic staff by themselves, foundation universities continue their programs with the staff they transfer from public universities or from abroad.

One of the functions that is expected from the academic staff working in foundation universities is the research function of the staff. It cannot be argued that foundation universities are at the desired level in the list of total publications which is an important indicator of the dissemination of scientific knowledge. Only one foundation university (Başkent) is in the top 20 in the ranking of universities as to overall publications in SCI+SSCI+AHCI. Besides this performance of certain foundation universities in research activities, 14 of the last 20 among all universities in the individual publication list are foundation universities. Again, 18 of the last 20 in the total publication list are the foundation universities.

Conclusion and suggestions

Privatization policies have been implemented generally in education and specifically in higher education as a result of neoliberal policies that started to be dominant in all policies and social realms in Turkey as of 1980s. In

this period, when the private organizations in Turkey started to modify education under market conditions, the private sector entered the higher education system via non-profit foundation universities.

It is for the first time with the sixth five-year development plan among the five plans, which were prepared between 1980 and 2008, that it is stated that foundations will be encouraged to establish private universities and policies will be formulated accordingly. The highest number of foundation universities was established during the seventh five-year development plan. 17 foundation universities during the time of the seventh five-year development plan which covered the years between 1996 and 2000.

The period that witnessed the establishment of the highest number of foundation universities between 1980 and 2008 is the period between the years 1996 and 1998 when Mesut Yılmaz was the prime minister of the government. 15 foundation universities were opened during this period. Half of the foundation universities were, in other words, opened during the period when Mesut Yılmaz was the prime minister. The prime minister that follows Mesut Yılmaz in terms of witnessing the opening of foundation universities is Recep Tayyip Erdoğan. 7 foundation universities were opened during the period between 2003 and 2007 when Recep Tayyip Erdoğan was the prime minister. The president who approved the highest number of laws regarding the opening of foundation universities is the 9th president Süleyman Demirel. To 2008 there were 30 foundation universities in the Turkish higher education system. Süleyman Demirel signed the laws of seventeen of the thirty foundation universities as the president. One foundation university was also opened during the prime ministry of Süleyman Demirel.

While only one the foundation university was opened in the decade between 1980 and 1990, 22 foundation universities were opened during the period between 1991 and 2001. Twenty-two of the existing 30 foundation univer-

sities in 2007, or in other words 74% of the existing foundation universities, were opened between 1991 and 2001.

Whereas the number of students in foundation universities in the 1986-1987 academic year was 426, this figure increased to 109,903 in 25 foundation universities in the 2006-2007 academic year. The annual increase rate of the students in foundation universities in the two decades is 32%.

In the 2006-2007 academic year, 7766 academic staff and 2502 academic fellows work in the foundation universities and 109,903 students are enrolled in these universities. The number of students per academic staff in the foundation universities is 21, while this number is 44 per academic fellow in the 2006-2007 academic year.

Higher education is a public service as to the article 130 of the Constitution. However, public funding is implemented in public universities, while the private funding model is implemented foundation universities. Although foundation universities are financed by the private funding model, they also benefit from the public funding by taking subvention from the state budget. In this sense, the state contribution to already-developed foundation universities should be ceased.

While the number of students per academic staff in the foundation universities is 21 in the 2006-2007 academic year, this number is 44 per academic fellows. This figure affects the quality of education. Foundation universities should formulate policies as soon as possible that will increase the number of academic fellows. Foundation universities that cannot ensure the required number of academic fellows should not be allowed to be founded.

Foundation universities should develop programs as soon as possible to educate academic fellows. They should, in cooperation with their own sub-divisions and with public universities, launch arrange-

ments that will develop their own academic fellow resources.

Launching programs that are appropriate for market conditions contradicts the foundation mission of foundation universities. It is interesting that only eight of the non-profit foundation universities have philosophy departments. Foundation universities should launched programs not for the market conditions, but for their scientific perspectives.

Most of the foundation universities are located in the three big cities. This situation prevents the equal distribution of the quality of higher education among the regions. Policies should be developed that will ensure equal distribution of foundation universities among the regions.

Following the Law No 2547 that grants the private sector to establish foundation universities, Bilkent University was founded in 1984. The executive director of Bilkent Holding describes Bilkent as the following: "there not only schools, but also shopping centers and factories. The man can go to his factory, while the student goes to school, and the woman goes to the shopping center" (Dikmen, 2001). This perspective shows that foundation universities are not considered as non-profit educational institutions, but as a business. Foundation universities should flourish as educational institutions, rather than flourishing and developing based on a business perspective.

NOTES

1. This study was submitted as an announcement in the conference of the foundation universities of Turkey, which was held in April, 2008.
2. http://www.yok.gov.tr/mevzuat/yonet/yonet35.html
3. http://www.tbmm.gov.tr

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EFFECTS OF TEACHING MATERIAL BASED ON 5E MODEL REMOVED PRE-SERVICE TEACHERS' MISCONCEPTIONS ABOUT ACIDS-BASES[1)]

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Abstract. The aim of this study is to determine effect of teaching material based on 5E model on pre-service teachers' conceptual change 'acid-bases' subject. This research was carried out with 25 sophomore pre-service teachers at Artvin Çoruh University Faculty of Education who were enrolled to science laboratory practices course in 2006–2007 instructional term-fall semesters. In this study, one-group pretest-posttest design was used. The study consisted of three phases; in the first part, a concept test with ten open ended questions was employed to determine student's misconceptions about 'acid-bases' subject. In the second part, an activity based on 5E model was developed and implemented as a teaching intervention. In the last part, the concept test was re-administered after the teaching intervention. It was found that pre-service teachers had many misconceptions about acid and bases as found in

literature. Moreover, teaching material based on the 5E model is concluded to be quite effective solving misconceptions.

Keywords: acids and bases, pre-service teachers, conceptual change, constructivist approach, 5E model, misconceptions

Introduction

In recent years rapid developments in science made it hard to keep up with the changes in the field. To keep pace, researchers firstly try to understand the dimension of a concept instead of learning all of them. Concept learning has a strong influence on preventing complexity and confusion in students' minds in order to help classify or categorize the information in their memories (Çepni et al., 2005). Ayas et al. (1997) and Çepni et al. (2005) emphasize that two basic methods that are related to concept learning. These are inductive and deductive methods. In the deductive method, the teacher wants his/her students to find suitable or unsuitable examples for a concept when she/he is giving a description or definition of the concept. In the inductive method, the teacher allows his/her students to make generalizations with the best examples. In this method, the students should determine the quality of the description and distinction by examining the relevant or irrelevant examples of the concept (Çepni et al., 2005).

There are some factors that affect the concept learning method. One of the most important factors that affect the concept learning is the students' pre-knowledge before instruction (Özmen & Demircioglu, 2003). A lot of research designates that students come to the classroom with various pre-knowledge and concepts, which are different from scientific surroundings related to scientific events. Pre-knowledge fixed in students' mind prevents from their learning scientific principles and concepts in a correct way (Anderson, 1986; Griffiths & Preston, 1992). Because of this, student's pre-knowledge and misconception should be revealed and instructive activities

should be planned according to this situation (Coştu et al., 2007). In this context, the primary stage of concept instruction and the determination of misconceptions as a result of students' pre-knowledge are important.

A literature review has determined that there are misconceptions in a lot of science subjects such as chemical bonding, chemical change, mole, gases, nature of solutions, chemical reactions, acid-bases and particulate nature of matter including acids and bases. In national and international literature, research about the acids and bases is focused on students who are different grades and various levels, such as primary school, high school and university (Cros et al., 1986; Cros et al., 1988; Hand & Treagust, 1991; Ross & Munby, 1991; Schmidt, 1991; Nakhleh & Krajcik, 1993, 1994; Botton, 1995; Bradley & Mosimege, 1998; Toplis, 1998; Sisovic & Bojovic, 2000; Demircioğlu et al., 2001, 2002, 2004; Demircioğlu, 2003, 2009; Demircioğlu et al, 2005; Demerouti et., 2004; Özmen & Yıldırım, 2005; Özmen et al., 2009). Some of this research related to students' understanding of concepts after instruction activities, and some parts of the research related to how to present these subjects more efficiently using different learning methods. Besides, most of the researchers determined misconceptions related to acid and bases. Researchers pointed out that students in different levels have difficulty in understanding the concept of acids and bases concepts and students have some misconception related to ionic nature of acids and bases, general feature of acid and base, features of strong and weak acid-bases, PH and POH concepts, neutralization, features of salts that occur as a result of acid and bases reaction. Taking care of this, it is very important to remove different levels students' misconceptions about acid and bases. According to Christianson & Fisher (1999), identifying students' alternative conceptions are very important; however, finding ways to eliminate or overcome these conceptions is more important.

In recent years, different methods are used to overcome misconceptions. One way to close the gap between alternative conceptions and scientists' con-

ceptualization is to use conceptual change learning models (Hewson, 1981; Hewson & Hewson, 1983; Posner et al., 1982). In general, conceptual change has been described as a part of learning mechanism that requires the learners to change their conceptions about a phenomenon or principle either through restructuring or integrating new information into their existing schemata (Hewson, 1996). The conceptual change approach was developed by Posner et al. (1982) and Hewson (1981). Posner et al.'s (1982) conceptual change model asserts that a concept has to be built upon students' prior ideas about that concept (Hewson, 1981). Posner et al. (1982) suggested four conditions: (1) students must become dissatisfied with their existing conceptions (dissatisfaction); (2) the new concept must be clear and understandable for students (intelligibility); (3) the current problem should be solved by using the new concept (plausibility); (4) similar future problems can be solved by using the new concept (fruitfulness). Generally there are a lot of teaching methods such as analogies, concept mapping, worksheets, hands on activities and conceptual change texts based on conceptual change model. Most of them were developed to use Piaget's ideas and principles of constructivist learning theory (Hewson & Hewson, 1983; Hynd et al., 1994; Stofflett, 1994; Posner et al., 1982). Since constructivism not only stresses students' pre-exist knowledge but also engages students actively, much more research has paid more attention on students' alternative conceptions, and conceptual change (Kurnaz & Çalık, 2008). It is said that most conceptual change models consider the basic principle of constructivism that knowledge is actively constructed by the learner.

The constructivist approach defends that students do not take the knowledge as given to them by teachers, but they rather restructure that knowledge themselves (Bodner, 1986, 1990). When the constructivist approach is applied to create meaningful learning, a suitable environment needs to be provided to help students to develop their own knowledge by testing

their own experience (Çepni et al., 2000; Özmen, 2004). Beliefs and attitudes from a student's family, environment or culture will constitute principles for their future learning (Osborne & Wittrock, 1983). Also, it is thought that the biggest effect on learning new knowledge and concepts is pre-existing knowledge in contradiction with scientific knowledge (Bodner, 1986, 1990; Driver, 1991; Head, 1982; Hand & Treagust, 1991; Karataş, 2003). Students' pre-existing knowledge or misconceptions negatively affect their next learning. Therefore, giving students new knowledge related to previous knowledge accumulation and correcting misconceptions is thought to be necessity (Coştu et al, 2003). Students have an active role on the learning process including activities such as discussion, experiences, advocating ideas, developing hypothesis, interrogation and sharing ideas (Çardak at al., 2008) Also, students do not accept knowledge as it is, rather they create or explore the knowledge (Perkins, 1999). So constructivist approach is useful for removing misconception.

The constructivist approach has learning models such as 4E, 5E and 7E models available for using in a learning environment. The 5E model, which was developed by Bybee who was a leader of Biological Science Curriculum Study (BSC), is the most popular version (Keser 2003; Kurnaz & Çalık, 2008). The 5E model consists of activities that increase student's inquiry and curiosity, answers the expectation of the subject and includes active use of information and skill (Özsevgec, 2006). The 5E model includes students in activities at every stage and also encourages them to form their own concepts (Ergin, 2006). Furthermore, this model is used as the embodiment of the constructivist approach and is composed of activities that increases students' concerns, supports their expectations related to the topic and includes active use of their knowledge and skills (Çardak et al, 2008). Studies conducted using the 5E instructional model reveal that the model increases the success of students, elevates their conceptual understandings and positively changes their

attitudes (Baker & Piburn, 1997; Kör, 2006; Özsevgec et al., 2006; Saglam, 2006; Çardak et al, 2008**).**

So, the aim of this study is to determine the effect of teaching material based on 5E model on pre-service teachers' conceptual change 'acid and bases' subject.

Methods

Experimental research methods were used in order to measure variables and the differences reveal between reason and result (Çepni, 2005). In this study, a one-group pretest-posttest design was used. Pretest-posttest designs are widely used for the purpose of comparing groups and/or measuring change resulting from experimental treatments (Cressweel, 2002). It was tried to determine to measure the change resulting from experimental treatments in this study. This research was carried out with 25 sophomore pre-service teachers at Artvin Çoruh University Faculty of Education who were enrolled to science laboratory practices course in 2006–2007 instructional term-fall semesters. The sample of this study consists of 11 men and 14 women pre-service teachers. These pre-service teachers learned about the acids and bases topic at primary school, high school and university. All of them succeed in learning about the acids and bases topic.

The study consisted of three phases; in the first part, concept tests with ten open-ended questions were employed to determine on students' misconceptions about acids and bases. In the second part, an activity based on the 5E model was developed and implemented as a teaching intervention by the researcher within four weeks. Preparing instructional material based on the 5E model gave knowledge as general features of acids and bases, features of strong and weak acid-bases, PH and POH concepts and features of salts that occur as a result of acids and bases reaction. In the last part, the concept test

was re-administered after the teaching intervention. This experimental process was completed nearly within six weeks.

Process of developing instructional material

The instructional material was based on the constructivist approach's 5E models in order to remove pre-service teachers' misconception about acids and bases. Instructional material was focused on (a) general feature of acid and base, (b) features of strong and weak acid-bases, (c) PH and POH concepts and (d) features of salt which occur as a result of acid and bases reaction. Consequently, four instructional materials were developed by researcher. Each subject was tried to teach instructional materials based on 5E model. The 5E models consist of five phases including engagement, exploration, explanation, elaboration and evaluation.

In the engagement stage, it was firstly required that teacher assesses the pre-service teachers' prior knowledge and helps them to become engaged in a new concept through the use of short activities. Pre-service teachers were asked some questions about acids, bases, strong and weak acids and bases, the concept of PH and POH and types of salt in order to determine on pre-service teachers' pre-knowledge and misconception. The researcher told a story about the relationship among properties of acids and bases, the results of a reaction between acids and bases and acidic and basic salt reactions. After this story was told, students were asked some questions about it.

In the exploration stage, pre-service teachers were divided into five groups, five pre-service teachers in each group. Students tried some experiments about the properties of acids and basses, strong and weak acids and basses, determinations of PH and POH, reactions between acids and basses, strong acids and strong basses, strong acids and weak basses, strong basses and weak acids and features of salt and its varying types. Every group discussed with the others groups

In the explanation stage, after each group completed activities, they were asked some questions related to experiments at the exploration stage in order to present their structured knowledge claims and share their ideas with their peers through a class discussion. Then, the teacher confirms/disconfirms the students' gained knowledge claims, so that the students can compare their newly structured ideas with those presented by the teacher.

In the elaboration stage, it was required that teachers challenge and extend pre-service teachers' conceptual understanding and skills and that student test their understanding of the concept and/or apply it to a real world situation. In this stage, Pre-service teachers were given problems related to acids and bases subject. Then, asked solution problems. Pre-service teachers were wanted to answer problems correctly by researchers.

In the evaluation stage, the students were given a performance task. In this performance task, students were asked to write a dialogue related to learn about acids and bases. Students were asked to construct a concept map. For this, students were given ten concepts: acids, bases, strong acids, strong bases, weak acids, weak bases, PH and POH, acidic salt, basic salt and neutral salt. Students were asked to outline what they had learned in order to become conscious of their learning.

One of four instructional materials related to general feature of acid and bases was given in Appendix.

Data collection tool

In literature, there are a lot of methods to determine misconception. These methods are; concept mapping, prediction-observation-explanation, interview about instances and events, interview about concept and drawing, word association, fortune lines, diagnostic test (Çepni et al., 2005; White & Gunstone, 1992; Schmidt, 1997; Ayas et al., 2001). In this research, it was used a diagnostic test to determine pre-service teachers' misconceptions about

acid and bases. Pre-service teachers were asked ten open-ended questions in order to determine pre-service teachers' misconception about general features of acid and bases, features of strong and weak acid-bases, definition of PH and POH conception, features of salt which occur as a result of reaction between acids and bases. Providing content reliability of this concept test was examined by three experts, two chemistry teachers and one Turkish teacher. Then, according to feedback, the concept test was reorganized.

The ten questions in the concept test are: (1) what do you understand about acids and bases concept? Explain using examples; (2) have do you heard of "strong and weak acid" concepts? If yes, explain what these concepts mean; (3) what do you know about strong and weak bases? Explain what you know; (4) what do you understand about PH and POH concepts? (5) Ali thinks that strong acids contain so many hydrogen ions and weak acids contain very few hydrogen ions. In your opinion, is Ali's view correct or incorrect? Explain with reasons; (6) Mehmet understands that bases that contains OH ion but not contain any H ion. Do you agree with Mehmet's opinion? If you agree, why? If you disagree, why? Please explain; (7) when a solution of strong bases is poured solution of weak acid, it consists of salt that occurs as a result of reaction. When we pour strong bases on this salt again, is there any reaction? Explain your reasoning; (8) when a solution of weak bases is poured on a solution of a strong acid, it consists of salt that occurs as a result of reaction. When we pour strong bases on this salt again, is there any reaction? Explain your reasoning; (9) when a solution of strong bases is poured solution of strong acid, it consists of salt that occurs as the result of reaction. When we pour strong bases on this salt again, is there any reaction? Explain your reasoning; (10) Ahmet thinks that strong acid is sourer than weak acid. Do you agree with Ahmet's idea? If you agree, why? If you disagree, why? Please explain.

Data analysis

In this phase the prospective teachers' answers to ten open-ended questions applied pre and posttest were analyzed by the researchers. The researchers tried to determine misconceptions about acids and bases. The open-ended questions were analyzed under the following categories and headings, which were suggested by Ayas & Özmen (1998), Ayas (1995) and Demircioğlu et al. (2001). A sound understanding included all components of the validated response. Partial Understanding included responses where at least one of the components of validated the response, but not all the components. Partial understanding with specific misconception included an understanding of the concept, but also made a statement that demonstrated a misunderstanding. Responses labeled no understanding included illogical or incorrect information or repeated the question, contained irrelevant information or an unclear response or the student left the response blank. These criteria provided an opportunity to classify students' responses and make comparisons about their level of understanding. Next, the frequency and percentage were determined.

Findings

Researcher analyzed the pre-service teachers' answers to the questions in the concept test applied as pre and posttest in order to determine changes to the pre-service teachers' misconceptions about acids and basses. Table 1 shows the findings from these analyses.

Table 1. Frequencies and percentages of pre-service teachers' answers in four categories

	Pre-test								Post-test							
	SU	%	PU	%	PUSM	%	NU	%	SU	%	PU	%	PUSM	%	NU	%
1	6	24	4	16	14	56	1	4	22	88	3	12	-	-	-	-
2	1	4	2	8	22	88	-	-	24	96	1	4	-	-	-	-
3	1	4	1	4	16	64	7	28	23	92	2	8	-	-	-	-
4	1	4	11	44	6	24	7	28	21	84	4	16	-	-	-	-
5	-	-	1	4	22	88	2	8	19	76	3	12	2	8	1	4

6	-	-	5	20	9	36	11	44	15	60	5	20	1	4	4	16
7	1	4	4	16	8	32	12	48	17	68	1	4	2	8	5	20
8	1	4	3	12	6	24	15	60	15	60	1	4	2	8	7	28
9	1	4	2	8	6	24	17	68	13	52	1	4	3	12	8	32
10	-	-	4	16	12	48	9	36	18	72	2	8	4	16	1	4

SU= Sound Understanding PU= Partial Understanding PUSM= Partial Understanding with Specific Misconception, NU=No Understanding

When investigated Table 1, determined that pre-service teachers' answers were different between the pre and posttest. In the pre-test, pre-service teachers' answers to the ten questions were divided into four categories. It was seen that pre-service teachers' answers were between 0 % and 24 % for sound understanding, between 4 % and 44 % for partial understanding, between 24 % and 88 % for partial understanding with specific misconception and between 0 % and 68 % for no understanding. Furthermore, in the post- test, pre-service teachers' answers were between 52 % and 96 % for a sound understanding, between 4 % and 29 % for partial understanding, between 0 % and 16 % for partial understanding with specific misconception and between 0% and 32 % for no understanding. According to these results it was understood that pre-service teachers' misconceptions and misunderstanding were related to acid and bases increased.

In this study, pre-service teachers' misconceptions were identified in the pretest and posttest. It was seen that whether or not these misconceptions were removed. According to the pre and post test results, researcher consists of tables to include frequencies and percentages of misconceptions about general features of acids and bases, features of strong and weak acids-bases, the definitions of PH and POH conceptions and features of salt that occur as a result of the reaction between acids and bases.

The results of misconceptions about general features of acids and bases were given in Table 2.

Table 2. Frequency and percentage of pre-service teachers' misconceptions about general features of acids and bases

	Pre-test		Post-test	
	f	**%**	**f**	**%**
Bases have only OH ions but not H ions	8	32	1	4
While bases changes blue litmus to red, acid changes red litmus to blue.	6	24	-	-
Acids burns and melts everything	3	12	-	-
While the taste of acids are bitter, taste of bases are sour.	2	8	-	-
Any substance that contains the H atom is an acid, an OH molecule is a base.	2	8	-	-
All acids and bases are harmful and poisonous	2	8	-	-
While acid have OH ions, basses do not have H ions	1	4	-	-

When investigated as shown in Table 2, in pre-test determined that 32 % of pre-service teachers have a misconception that "bases have only OH ions but not H ions" and 32 % of pre-service teachers have a misconception that "while bases changes blue litmus to red, acid changes red litmus to blue." It was also revealed that 32 % of pre-service teachers think that "Acid burns and melts everything". In post-test, it was determined that 4 % of pre-service teachers have a misconception that "bases have only OH ions but not H ions", the others misconceptions were removed.

Secondly, results of the misconceptions about general features of strong and weak acid-bases are given in Table 3.

Table 3. Frequency and percentages of pre-service teachers' misconceptions about features of strong and weak acid-bases

	Pre-test		Post-test	
	f	**%**	**f**	**%**
Strong bases contain more OH ions than weak bases	6	24	-	-
Strong acids contain more H ions than weak acids	5	20	-	-
Strong acids do not easily react	3	12	-	-
Weak acids do not easily react	3	12	-	-
Strong acids are sourer than weak acids	3	12	-	-
Strong acids burn more than weak acids	2	8	-	-
NH_3 and CH_3COOH are strong acids	2	8	-	-
The PH of weak acid is between 0 and 7	1	4	-	-
The PH of strong acid is between 7 and 14	1	4	-	-
The POH of weak bases is between 0 and	1	4	-	-

The POH of strong bases is between 7 and 14	1	4	-	-
While a strong acid has strong bonding among molecules, a weak acid has weak bonds among molecules.	1	4	-	-
CH_3 is a strong acid	1	4	-	-
CH_3COOH is a strong base	1	4	-	-
Strong bases don not convey to electricity	1	4	-	-
While strong bases have strong bonds among molecules, weak bases have weak bonds among molecules	1	4	-	-
C_2H_5OH is a weak base	1	4	-	-

As seen Table 3, in pre-test it was determined that 24 % of pre-service teachers have a misconception that "strong bases contain more OH ions than weak bases." and 20 % of pre-service teachers have a misconception that "strong acids contain more H ions than weak acids." Besides it was revealed that while 12 % of pre-service teachers think that "strong acids do not easily react." 12 % of pre-service teachers think that "weak acids do not easily react." Furthermore, 12 % of pre-service teachers have a misconception that "strong acids are sourer than weak acids". In post-test, it was determined that pre-service teachers' misconceptions form the pretest was completely removed.

Third, a result of misconceptions about definition of PH and POH conception is given in Table 4.

Table 4. Frequency and percentages of pre-service teachers' misconceptions about definition of PH and POH conception

	Pre-test		Post-test	
	f	%	f	%
PH is a measure of acidity.	2	8	-	-
POH is a measure of bassist.	2	8	-	-
As the value of PH increases, acidity increases	1	4	-	-
As the value of POH increases, bassist increases	1	4	-	-

As it was seen Table 4, according to results of pre-test, 8 % of pre-service teachers have a misconception that "PH is a measure of acidity.", 8 % of pre-service teachers have a misconception that "POH is a measure of bassist." 4 % of pre-service teachers think that "as the value of PH increases, acidi-

ty increases." 4 % of pre-service teachers think that "as the value of POH increases, bassist increases". In posttest, it was determined that pre-service teachers' misconceptions in the pretest were completely removed.

Fourth, results of misconceptions about features of salt occur as a result of reaction between acids and bases is given in Table 5.

Table 5. Frequency and percentage of pre-service teachers' misconceptions about features of salt that occurs as a result of a reaction between acids and bases

	Pre-test		Post-test	
	f	%	f	%
Salt consists of a reaction between strong base and weak acid don't react again to strong acids	4	16	1	4
Salt consists of a reaction between strong acid and strong bases which react again to acids or bases.	3	12	-	-
Salt consists of a reaction between strong acid and weak bases don't react again to strong bases.	2	8	-	-
Salt consists of a reaction between strong acid and strong bases react again to strong acids or bases	2	8	1	4
Acids have a solution feature	2	8	1	4
Neutral salts react with acids and bases	2	8	-	-
Salt consists of a reaction between strong acid and weak base only react again to weak bases.	1	4	-	-
Salt consists of a reaction between strong acid and weak bases. But it doesn't react again to weak base.	1	4	-	-
Salt consists of a reaction between strong acid and weak base. This salt is a neutral salt.	1	4	-	-

According to results of pre-test, it was revealed that 16 % of pre-service teachers have a misconception that "salt consists of a reaction between strong base and weak acid don't react again to strong acids" and 12 % of pre-service teachers have a misconception that "salt consists of a reaction between strong acid and strong bases which react again to acids or bases" 8 % of pre-service teachers think that "salt consists of a reaction between strong acid and weak bases don't react again to strong bases." 8 % of pre-service teachers think that "salt consists of a reaction between strong acid and strong bases react again to strong acids or bases". In post-test, it was determined that most of the pre-service teachers' misconceptions in pre- test were removed.

After the instructional material was applied, it was seen that pre-service teachers' misconceptions about acid and bases were decreased and these teachers effectively learned about this topic.

Discussion and conclusion

The main purpose of the present study was to investigate the effectiveness of teaching material based on 5E model on pre-service teachers' conceptual change 'acid and bases' subject. In this study, concept test with ten open and questions were administered before the study in order to determine students' prior knowledge, because students' prior knowledge is important in the integration and construction of new knowledge in their existent cognitive structures (Önder & Geban 2006). In this study, it was revealed that pre-service teachers have some misconceptions about acid and bases subject the same as others studies. It was seen that these misconceptions related to general features of acid and bases, features of strong and weak acids-bases, definition of PH and POH conception and features of salt which occurs as a result of reaction between acids and bases

When it was seen pre-service teachers' misconceptions related to general features of acids and bases, pre-service teachers have misconceptions that bases turn blue litmus paper red, and acids turns red litmus paper blue; and that acids burn and melt everything and bases have only OH ions but not H ions. These misconceptions were identified in the studies of Cros et al., 1986; Cros et al., 1988; Ozmen & Demircioğlu, 2002; Morgil et al., 2002; Demircioğlu et al., 2005; Hand & Treagust, 1991; Demircioğlu, 2010; Nakhleh & Krajcik, 1994. It is thought that students have these misconceptions related to general features of acid and bases because of mistaking usage of these concepts in daily life. If acid and bases concepts were related to everyday life during teaching, their retention in the learner's mind was greater. This idea was supported by Demircioğlu et al. (2005). After teaching material

based on 5E models were implied, it was seen Table 2, most of pre-service teachers' misconceptions about general features of acid and bases. This result arises from giving samples related acid and bases to students in daily life during application of teaching material based on 5E model. Besides, students see and do experiments related features of acid and bases in classroom and it was allowed that students construct their knowledge and concepts. Anyway, in constructivist approach, it is suggested that learners construct their knowledge and concepts in the direction of their abilities and experiences (Osborne & Cosgrove, 1983).

Besides, before teaching materials based on 5E model were applied, pre-service teachers have misconceptions related to features of strong and weak acids-bases. Pre-service teachers have misconceptions that strong bases contain more OH ions than weak bases, strong acids contain more H ions than weak acids, strong acids do not easily react, weak acids do not easily react; strong acids are sourer than weak acids and strong acids burn more than weak acids. These misconceptions were seen in many studies including: Bradley & Mosimege, 1998; Hand & Treagust, 1991; Schmidt, 1991; Demircioğlu et al., 2005; Çetingül & Geban, 2005; Nakhleh & Krajcik, 1994 and Demircioğlu, 2010. Furthermore, pre-service teachers' misconceptions related to definition of pH and pOH conception that pH is a measure of acidity, pOH is a measure of bassist, as the value of pH increases, acidity increases and as the value of pOH increases, bassist increases. In literature, the same of these misconceptions were seen studies of Cros et al., 1986; Cros et al., 1988; Hand & Treagust, 1991; Ross & Munby, 1991; Demircioğlu et al., 2002; Morgil et al., 2002; Köseoğlu et al., 2002 and Demircioğlu et al., 2005. Strong and weak acid-bases and pH and pOH conception are very abstract concept. So, students have difficulty in learning of these concepts. Generally, Students have many misconceptions about these concepts. For this, when these concepts were teached by teachers, it was tried that these concepts were concretized. So, it is

important that instructional material which helps to student for concretion of concepts was used in the classroom. In this respect, it is revealed that using instructional material based on 5E model in this study help to student for concretion of strong and weak acid-bases and pH and pOH concepts. This result is said that it was seen Table 3 and Table 4. Besides, it is said that instructional material based on 5E model effectively, because students overcome misconception related to strong and weak acid-bases and pH and pOH concepts.

In addition to these, pre-service teachers' misconceptions about features of salt occur as a result of a reaction between acids and bases. Pre-service teachers have misconceptions that salt consists of a reaction between strong base and weak acid don't react again to strong acids, salt consists of a reaction between strong acid and strong bases which react again to acids or bases, salt consists of a reaction between strong acid and weak bases don't react again to strong bases and salt consists of a reaction between strong acid and strong bases react again to strong acids or bases. These misconceptions were similar to Schmidt (1991), Demircioğlu et al. (2002), Ozmen & Demircioğlu (2003).

After teaching material based on 5E models was used, Table 3, 4, 5 shows that all of the pre-service teachers' misconceptions about the general features of acid and bases, features of strong and weak acids and bases, the definition of pH and pOH conception and features of salt that occurs as a result of a reaction between acids and bases were removed. Most of pre-service teachers learned to these topics and increased their knowledge (as seen Table 1). Similarly, studies conducted using the 5E instructional model, evidence repeatedly reveals that the model increases the success of students, elevates conceptual understandings, removes misconceptions and positively changes their attitudes (Baker & Piburn, 1997; Kor, 2006; Ozsevgec et al., 2006; Saglam, 2006; Çardak et al., 2008). The 5E model includes students in activities at every stage and also encourages them to form their own concepts (Engin,

2006). Furthermore, this model that is embodiment of the constructivist approach and is composed of activities that increases students' concerns, supports their expectations related to the topic and includes active use of their knowledge and skills (Çardak et al., 2008).

NOTES

1.   This study was presented an oral presentation in the 16th National Educational Science Congress, 5 – 7 September 2007.

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APPENDIX

In engagement stage

In this stage, it was required that teacher assesses the pre-service teachers' prior knowledge and helps them to become engaged in a new concept through the use of short activities. So, firstly, it was told a short story about acid and bases subject to pre-service teachers by researcher. This story was given below.

There is a village in the bottom of mountain in Artvin. This village has two rivers. These rivers are surrounding to village. One of these rivers reserves right place of village called A river. Another river reserves on the left place of village called B river. A river has some features. For example; water of A river has bitter taste, has slippery features, some material change colour from red to blue in this river. But, water of B river has sour taste, has sharply smell, and some material change colour from blue to red in this river. When water of these rivers is compound, it consists of white precipitate.

After this story was told; pre-service teachers were asked to some questions related with this story: (1) in your opinions, what can be water of A river; (2) In your opinions, what can be water of B river; (3) What can be a white precipitate, which consists of the time these rivers' water is compound; (4) Have do you heard any material change colour from red to blue or from blue to red in some matter.

In exploration stage

In stage, pre-service teachers were divided into five groups; in each group has five pre-service teachers. Then students tried to some experiments about properties of acid and bases.

Pre-service teachers was given some matters such as soap, tap water, rain water, soda water, vinegar, lemon juice, wine, coca-cola, milk, aspirin, shampoo, strawberry, apple, plum, tomato and distilled water. Also, it was given a roll litmus paper, a strip red cabbage paper, 2 – 3 glass pots, 2 glass rods to them. Then, pre-service teachers were asked to investigate effect of these materials on litmus paper and red cabbage paper and filled to table in below.

Matters	Colour of litmus paper	Colour of red cabbage paper	Taste of matters
Soap			
Tap water			
Rain water			
Soda water			
Vinegar			
Lemon juice			
Coca-cola			
Milk			
Aspirin			
Shampoo			
Strawberry			
Apple			
Plum			
Tomato			
Distilled water			

In this step, pre-service teachers implement the related activities in their small group by means of directions and questions such as 'What did you observe in chancing of litmus paper colour? Please explain your reason', 'What did you observe on chancing of red cabbage paper colour? Please explain your reason', 'How taste matters have? Please explain'.

In this experimental process, researcher monitors pre-service teachers and their interactions with each other, so that she or he enables students to conduct an interpretive discussion. Besides, pre-service teachers can explain unclear points but refrains from any clue.

In explanation stage

At explanation stage, after each group completed activities, they was asked to some questions related to experiments such as 'How acid has an effect on changing litmus paper colour and red cabbage paper colour', 'How bases have an effect on changing litmus paper colour and red cabbage paper colour', 'Which matters acid and bases are' and 'How relation there are taste and litmus paper colour or red cabbage paper colour? Please explain' in order to present their structured knowledge claims and share their ideas with their peers through a class discussion. Then, the teacher confirms/disconfirms pre-service teachers' gained knowledge claims, so that the students compare their newly structured ideas with those presented by the teacher.

In elaboration stage

At the stage, it was required that teachers challenge and extend pre-service teachers' conceptual understanding and skills and their understanding of the concept and/or apply it to a real world situation. So, Pre-service teachers were given three clean liquid in three per-glasses. Then, they were told to one of these liquid is acid, the other is bases and another is water. But pre-service teachers don't know that which liquid is acid or bases or water. They were asked to divide these liquids correctly and find which liquid is acid or bases or water.

In evaluation stage

At the evaluation stage, the students were given a performance task. In this performance task, pre-service teachers were asked to write a dialogue related to learn about acid and bases topic. Besides, pre-service teachers were asked to construct a concept map. For this, students were given nine terms as acid, bases, litmus paper, blue, red, sour, sharply smell and slippery. Furthermore, making pre-service teachers become conscious of their learning, they are asked to outline what they have learned.

Performance task

Yesterday, Mustafa didn't go to school as a result of being ill. So, he didn't learn acid and bases subject which was told by teachers yesterday. This day, Mustafa is going to school and he asks to explain knowledge related to acid and bases topic. Now, you are wanted to write a composition related to description and features of acid and bases and effects of acid and bases on litmus paper.

Concept map

Directions: Now, draw a concept map using the 7 terms in the box below. They are related to acid and bases subject. Write the terms in the bubbles below. Then draw lines with arrowheads on them between the bubbles to show which terms are related to each other. Then write one or a few words on each line to tell how the terms are related in your thinking. Remember, there isn't one "right answer." Everybody's map will be different. Just show the way YOU think about these things. Draw all the relationships that seem important to you.

1. Acid
2. Bases
3. Litmus Paper
4. Sour
5. Bitter
6. Sharply smell
7. Slippery
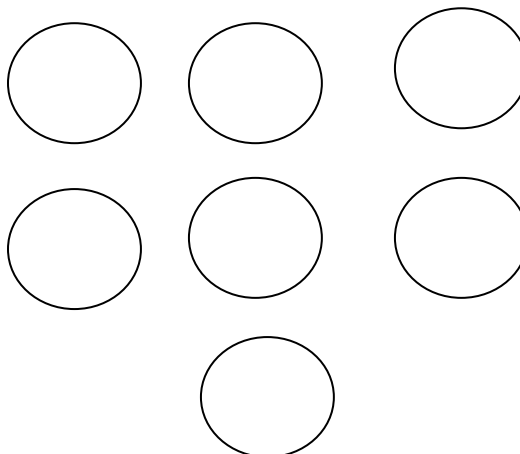
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INCORPORATING INDONESIAN STUDENTS' "FUNDS OF KNOWLEDGE" INTO TEACHING SCIENCE TO SUSTAIN THEIR INTEREST IN SCIENCE

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Abstract. The purpose of this study was to examine the effect of incorporating students' funds of knowledge in the teaching of science in sustaining Indonesian students' interest in science. The researchers employed mixed method approach in this study. This study took place within two suburban secondary schools in Indonesia. Two teachers and a total of 173 students (94 males and 79 females) participated in this study. The findings revealed that initially, most students expected that the teaching process would mainly include science experiments or other hands-on activities. Their preferences revealed a critical problem related to science learning: a lack of meaningful science-related activities in the classroom. The findings showed that incorporating students' funds of knowledge into science learning processes -and thus establishing students' culture as an important and valued aspect of science

learning was effective in not only sustaining but also improving students' attitudes and increasing their interest in science.

Introduction

There is a broad agreement that all teaching should "build on" the interests and experiences of the students. The lack of connection between students' experiences and science become increasingly as major concern for researchers in the area of science education research especially for students from marginalized groups. McNeill et al. (2005) identified that the differences between diverse students' everyday discourses versus classroom or scientific discourses may be one cause of the achievement gap.

Thus, this study was undertaken to examine the effect of incorporating students' funds of knowledge on sustaining students' interest towards science in Indonesian schools and draw some implication from findings in order to provide a valuable suggestion for developing teaching and learning science in Indonesian schools context.

Literature review

Students' funds of knowledge

González & Moll (2002) introduce the concept of 'funds of knowledge' to identify the connection between students' home experiences and their experiential knowledge, which can be valued as part of the epistemological tradition of the classroom. The authors note that funds of knowledge are based on a simple premise: that people are competent and knowledgeable and that their life experiences have given them that knowledge.

Funds of knowledge are the cultural artifacts and bodies of knowledge that underlie household activities (Basu & Barton, 2007). Funds of knowledge are knowledge and skills gained through historical and cultural interactions that are essential for individuals to have if they are to function appropriately within their communities. In addition, they also refer to experiences and knowledge that may be more particular to a family within the context of a community, such as the knowledge that a young person might have about the care of the elderly from growing up in a family and a community that includes multiple generations.

There are important cultural resources in communities surrounding schools. Funds of knowledge are grounded in the networking that communities do to make the best use of those resources. Funds of knowledge are also transmitted from one household to another or even to the greater community. Funds of knowledge therefore include knowledge, action, and disposition or habits, with the recognition of how each of these domains is culturally constructed and refined (Basu & Barton, 2007). These elements create the connections and interactions inherent in funds of knowledge.

Incorporating funds of knowledge into learning environments suggests that education should promote social relations between schools and homes, which in turn "establish and maintain necessary trust among participants [keeping] the system active and useful" (Bouillion & Gomez, 2001). These connections, established between the school and home through a ''funds of knowledge lens'', are strategic tools for teachers looking not only to incorporate into classroom work the kinds of knowledge that are used in students' homes but also to consider how that knowledge can be intentionally used to reach a set of greater goals (González & Moll, 2002).

The challenge for the teacher is to engage students from the beginning of the learning process so that the student will feel that their ideas and experiences are honored and believe that they have a chance and a hand in their own

learning. When students bring their culture into the classroom, the teacher should accommodate their life experiences to ensure effective teaching and promote "connected science" (Bouillion & Gomez, 2001) whereas scientific knowledge is applied to real-life situations to which students have been exposed. However, Fraser-Abder et al. (2006) note, the literature connecting at-home culture to the science classroom is still limited.

Developing a sustained interest in science

There is widespread agreement among educators that each society has to construct its own science curricula to fit its own needs and purposes regarding schooling. Academic science is only one of the possible inputs in this process of selection and construction. The consensus is that all teaching should consider the interests and experiences of students. In particular, everybody who subscribes to (some version of) educational constructivism will take such a stance for granted. For the material being taught to be meaningful for the learner, it must have some sort of relevance for him/her and must fit into his/her personal or societal context (Barton & Yang, 2000; Sjøberg, 2000).

Not only do learner experiences and interests vary, but it is also evident that there are similar variations in what can be said to be relevant and useful knowledge for students with such different life situations. Sjøberg (2000) argues that learning needs to be resilient to daily challenges and prepare students for a meaningful life, the definition of which will vary based on the different backgrounds of the students.

According to Sjøberg (2000) students' ideas about the nature of science, the personalities of scientists and the purpose and meaning of their activities may have different sources. They may emerge from the media and influences outside school, or they may arise from students' encounters with school science and science teachers. Some student ideas may arise from their own culture and the prevailing world-views, ideologies, and religious or other

sorts of beliefs associated with that culture. These factors are of a more affective nature; they are related to feelings, ideals and values. They may influence students' level of eagerness, motivation or interest in learning science.

Basu & Barton (2007) argue that science curricula are a key factor in developing and sustaining students' interest in science. There seems to be a broad agreement about the shortcomings of the traditional curricula that still exist in most countries. In that context, science is still mainly seen as a massive body of authoritative and unquestionable knowledge. Consequently, students may become disengaged from school science because their funds of knowledge are not incorporated into the science curriculum (Basu & Barton (2007)

Basu & Barton (2007) and Sjøberg (2002) further argue that to build on the interests and experiences of the learner, it may be necessary to abandon the notion of a common, more or less universal, science curriculum in favor of curricula and teaching materials that are more context-bound and that take into account for both gender and cultural diversity. It has also been argued that the problems related to interest in and attitudes about science cannot be regarded as solely educational but rather need to be understood and addressed in a wider social, cultural and political context (Sjøberg, 2002).

Based on Basu & Barton (2007) research findings, it is quite clear that the main reason for the decline in students' interest in science is not merely gender differences or the new approach to teaching and learning science. To develop and sustain students' interest in science, one should consider the entire interrelationship between curricular, behavioral, and organizational changes, the development of the interests and experiences of students, and an emphasis on students' funds of knowledge.

Methodology

This study employed a mixed-method design involving both quantitative and qualitative methods (Brewer & Hunter, 1989), aimed to examine the teaching of science which incorporated students' funds of knowledge on students' interests towards science. This study took place in two sub-urban Junior High Schools in Indonesia.

Participants

Students at St. George and St. Paul Secondary Schools (both school names are pseudonyms) formed the sample for this study. There were 173 students, 94 males and 79 females, most of whom were 13–14 years old. The students were from various socio-cultural backgrounds. A total of 79% of the students were Javanese, 17% were Chinese and the rest from the Batak, Papua, Melayu, Betawi, and Flores ethnic groups. There were no Chinese students in St. Paul. Almost all students in St. Paul were Javanese. However, in St. George, 40% of the students were Chinese. Two science teachers, one teacher from each school involved in this study.

A workshop for teachers

Prior to the teachers planning for instruction, a workshop facilitated by the researchers was conducted. During the workshop, the teachers were trained to incorporate students' funds of knowledge into their teaching. The elements of science learning that tend to make science foreign to students were discussed. To provide teachers with a clear understanding of the concept of funds of knowledge, a discussion session was established during the workshop. This session presented the means which teachers should investigate students' funds of knowledge. Finally, curricular design was also discussed; and an example of a lesson plan was introduced to the teachers.

Initially, the teachers maintained an explicit mode of instruction to promote student engagement. Because we were building on the strengths of teachers and on those of students with shared cultures, the researchers did not direct the teachers how to teach. However, the researchers did encourage the use of activities that gradually transitioned toward exploration as students gained experience with modes of inquiry. The teachers maintained structured classroom environments and were aware of difficulties that could arise if students were given tasks of which they had limited understanding and over which teachers exercised limited control.

Data collection and analysis

There were two questionnaires used in this study, *The changes in attitude about the relevance of science questionnaire* developed by Siegel & Ranney (2003) and *Students' Interests Questionnaire* developed by Trumper (2006).

(1) The changes in attitude about the relevance of science questionnaire

This questionnaire was designed to evaluate the developing changes in students' attitudes. The questionnaire consisted of 59 items separated into three partially redundant final scales (pretest, posttest, and delayed posttest) with 25 items each. The extreme categories of students' attitudes questionnaires in the Likert scale was labeled from *strongly disagree* (coded 1) to *strongly agree* (coded 5) Other questions had a list of statements, and the students were asked to indicate in a 5-point Likert scale whether they were *very not interested* (coded 1) or *very interested* (coded 5). The questionnaire was a reasonably reliable instrument, as indicated by the internal consistency of each scale being above 0.80, and for all 59 items it was 0.91.

(2) Students' Interests Questionnaire

This questionnaire was part of whole questionnaires developed and validated by Sjøberg during The Relevance of Science Education (ROSE) comparative project in 2003. The extreme categories of students' interests questionnaire in the Likert scale was labeled from *very not interested* (coded 1) to *very interested* (coded 5). This instrument consists of four domains as follows: a) students' interest in science (22 items with Cronbach's α = 0.88), b) students' attitude towards their science classes (13 items with Cronbach's α = 0.89), c) students' opinion about science and technology (16 items with Cronbach's α = 0.79), and d) students' interest in out-of-school experiences in science (17 items with Cronbach's α = 0.84). Only one domain (students' interest in science) was used in this research. Only 15 (out of 22) items relevant to the topics covered in the science curriculum at Grade VII and VIII Junior High School in Indonesia was selected.

This instrument has not been used in any Indonesian school before. The questionnaires were first translated into the Indonesian language. The instruments (the Indonesian version) had been used in a pilot study involving 79 Grade VII students in St. George. The results of the pilot test indicated that reliabilities of instruments (15 selected items) of students' interest in science was α = 0.78, indicating that the questionnaire is acceptable. Semi-structured interviews using open-ended questions were conducted to explore students' funds of knowledge. To develop rich, meaningful portraits of the students, they were invited to elaborate and expand their answers. There were 20 students involved in this interview process: 11 females and 9 males. The interviews lasted a half-hour to an hour depending on the amount of time allotted to the process by their schools. Students' responses to the questionnaire and their commentary in the interviews were considered in developing lesson plans that would incorporate their funds of knowledge. Interviews were also conducted with teachers to determine their insights into and experiences im-

plementing the lesson plans developed. To keep track of students' experiences, each student was given a task of journal writing in which to write about his/her experiences during the lesson. Students were also asked to keep track of their learning experiences in this journal. At the end of the study, the journals were collected as part of the data.

Additionally, questionnaires inquiring about student interests and attitudes were administered to examine changes in both of those areas. These questionnaires were administered before implementation (as a pre-test), after implementation (as a post-test) and at the end of the semester (as a delayed post-test). To facilitate the data analysis, all qualitative data collected were organized carefully. This process involved 'tidying up' data, organizing them into files, labeling the files, transferring them into an electronic format, putting them into directories, and organizing and reducing data according to ideas, themes, units, patterns, and structures that are visible within them. This involves some forms of coding and categorizing data. Participants' words as included in the following section are edited and translated as all participants use colloquial language (the Indonesian language).

Findings

Supportive learning environment

Specific students' responses stressed the learning process. Students felt that learning was exciting, interesting and even challenging. Using a teaching process in which students' funds of knowledge were incorporated made the concepts being learned seem more relevant and made them easier to understand. Table 1 shows the students' experiences with the learning process in terms of learning environment.

Table 1. Students' experiences in learning process

	Total (N=151)	St. George (N=65)	St. Paul (N=86)	Male (N=78)	Female (N=73)
Learning is exciting and interesting	60 (40%)	11 (17%)	49 (57%)	36 (46%)	24 (33%)
Learning is challenging	28 (19%)	8 (12%)	20 (23%)	18 (23%)	10 (14%)
Topics are relevant	29 (19%)	15 (23%)	14 (16%)	15 (19%)	14 (19%)

Forty percent of 151 students considered learning to be a complete process that was also exciting and interesting. Twenty-three percent of 65 students from St. George felt that topic they were learning about was relevant versus 16% of 86 students. The students from St. Paul felt that learning was challenging. The strategies for teaching science developed in this study helped the girls to understand science. More girls had experience that made the topics easy to understand.

The students felt that the classroom atmosphere was supportive and that this made them enjoy carrying out the activities. The lessons were both fun and challenging. Additionally, the teachers' support was effective and made lessons easy to understand. As for the media used by teacher, they made the topics and activities presented even the discussion interesting. The following excerpts are some examples of comments that demonstrate students' interest in this manner of learning.

> It is easy to learn and fun (Student Journal_1, line 473)
>
> Both teacher and friends are exciting (Student Journal_2, line 486)
>
> I can understand movement as discussed (Student Journal_2, line 1080)
>
> Fun in terms of classroom atmosphere and a good teacher support (Student Journal_2, line 65)
>
> I can ask friends and answer the questions of friends and lessons today is exciting (Student Journal_2, line 1268)
>
> Interesting because of the teacher's explanation (Student Journal_1, line 98)

The supportive environment led students to feel challenged and made them feel quite positive. Hence, the students' desire to ask their friends questions related to the subject at hand increased. Most of the students' responses noting that the lessons were also challenging indicated their curiosity about the topics, their wanting to know how things work, their wanting to know more about science, their wanting to know how to do experiments and how to formulate questions, and their wanting to understand more about daily life as it relates to science.

> There is new equation, I was curious of sound and others. (Student Journal_1, line 884)
>
> The examples of resonance phenomena motivate me to learn more on resonance (Student Journal_2, line 737)
>
> I want to understand more about daily life that related to science (Student Journal_2, line 545)
>
> I want to know how to do resonance experiment (Student Journal_2, line 618)
>
> I want to know how things work (Student Journal_2, line 15)
>
> I want to know more deeply about science (Student Journal_2, line 256)

The students responded that the topics being discussed were also relevant to everyday life. *"Teacher explained using story that related to topics and it could be applied in daily life"* (Student Journal_2, line 554). Moreover, the relevance of topics for discussion was also considered. "*In discussion of topics that usually be done in daily life*" (Student Journal_1, line 1126) Students' experiences as relevant to science teaching in this way increased their awareness about the relation between science and human life. The following excerpts are examples that demonstrate this.

> The phenomena that already happened actually related to science (Student Journal_2, line 596)
>
> The activities in science influence the daily life (Student Journal_2, line 627)

> Science is closely related to daily life (Student Journal_1, line 224)

> Science is important for people in daily life (Student Journal_2, line 114)

Even though incorporating students' funds of knowledge had an impact on student learning, there was also evidence that there were students who still did not find learning interesting when the material was presented in this way, as they explicitly expressed in their journals. The data also shows that only a small number of students were receptive to particular tasks, such as observing and designing experiments. For instance, 9% of 115 students were interested in designing experiments.

There is also evidence that being curious during learning activities has led students to develop awareness that these modes of learning could enable them to *"learn how to be a scientist"* (Student Journal_2, line 338). Furthermore, the students commented that during the activities, they felt like young scientists. The activities *"could make a child like a scientist"* (Student Journal_2, line 286).

Sustaining students' interest

The data above indicate an increase in students' interest in learning. The increase in students' curiosity is one of these indicators. The teachers' interviews also included similar evidence. The teacher from the lower-performance school (St. Paul) was very happy to discover that her students' behavior had changed for the better. This change was visible in their dedication to learn and improvement in their level of interest. The following excerpts provide specifics.

> In fact, they were happy with the lessons. Their interests emerge and one that I always feel was there was a smile. Moreover, after leaving the class they always asked "Miss, what else will we learn for tomorrow?" That made me challenging. It appeared that they were interested in the learning process that had been done. (Teacher Interview_2, line 204-209)

I observed, they were much more different, which used to shout or say "bad" words in the learning activities. It had been reduced even in outside the classroom, or when they passed me on the road. They were more polite, and I felt very happy with all this. Students now liked to ask me question in outside class. "Miss … so … it should relate to the science" "Then, what about this …? … That was great, so their interest in learning was increased. (Teacher Interview_2, line 378-386)

They were very open. They showed happiness on their face, not feeling bored. They welcomed me and looked happy with saying me "good morning Miss". They were always curious. Their curiosity was growing. (Teacher Interview_2, line 402-405)

Similarly, the teacher from St. George found that his students showed greater interest in their learning. They were eager to attempt the activities and specifically expressed that they had achieved what they had expected. The following excerpts indicate as much.

The first, their interests were excitement. That was something that…. (who) initially did not know…. through activities and found out by themselves ... that was something made them happy. They expressed with the expression "YES" loudly. (Teacher Interview_1, line 160-163)

It is more interesting. Yes, I was pleased them to find out for their own, and they did successfully, and then they expressed. That was later on,… if I made an evaluation ... ... the result was extraordinary. (Teacher Interview_1, line 174-176)

To find the level of students' interests and attitudes towards science, questionnaires were administered on three different occasions. The first questionnaire (Pre-test) was administered before the implementation of the new mode of instruction (at the beginning of the semester). The second questionnaire (Post-test) was administered right after implementation. The third questionnaire (Delayed post-test) was administered at the end of the semester. Fig. 1 shows the times when the questionnaires were administered and the results from the questionnaires. The findings from the three tests showed increasingly positive views toward science. The attitudes and interest of the students from St. George were scored on a 1–5 continuum, from ''strongly disagree'' to

''strongly agree'', with regard to the relevance of science. The scores averaged between 3 and 4 (neutral and agree) at every point in time. The average scores are shown in Fig. 1.

Time (Week)	Teaching Method	Questionnaires	Result: Mean Score (1-5 scale)			
			Attitudes		Interests	
			St. George	St. Paul	St. George	St. Paul
1	Traditional teaching	➢ Pretest	3.61 (.35)	3.60 (.33)	3.55 (.42)	3.70 (.42)
2						
3						
4						
5						
6	Teaching which incorporating students' Funds of Knowledge					
7						
8						
9						
10						
11						
12						
13						
14						
15	Traditional teaching	➢ Posttest	3.66 (.28)	3.70 (.30)	3.73 (.40)	3.80 (.44)
16						
17						
18		➢ Delayed Post-	3.77 (.25)	3.80 (.28)	3.84 (.36)	3.91 (.43)

Fig. 1. Mean score of students' attitudes and interests

Discussion

During the implementation phase, the students found that they were interested in learning when they were engaged in doing science. Hence, the students felt that the lessons were more interesting. They also noted that successfully performing an experiment or other activities helped to sustain their interest.

Students felt that the type of learning exercised was exciting, interesting and even challenging. Incorporating students' experiences into teaching as funds of knowledge made the concepts learned more relevant and easier to

understand. The classroom atmosphere was supportive, and as a result, the students became involved and enjoyed the activities. Additionally, teacher guidance made the lessons easy to understand. The supportive environment made students feel less challenged so that they could instead see science as something exciting; in other words, it stimulated their curiosity.

Even though taking into account students' funds of knowledge had an effect on student learning and engagement, there was also evidence that certain students remained disengaged from the material. Furthermore, there was evidence that classrooms were often noisy and chaotic, and such teaching practices were sometimes labeled as unsound. For example, Ms. Martha found it difficult to help her students engage in science in meaningful and empowering ways at the beginning.

> In fact, the first has not been successful. The latter have not yet increased as well. Just the third and fourth they would have to open their mind, reveal the ideas they want to, want to ask, appreciate a friend, and like to think .... (Teacher Interview_2, line 119-122)

> However, I have a problem, some students who tend to be less active in the classroom or students who like to ridicule friend when she revealed opinions. Indeed, it is not easy to change it in one or two days of teaching. Therefore, it is their basis and become part of their culture. (Teacher Interview_2, line 214-219)

Even though student-to-student communication did occur, there were many students who explained their thoughts to their friends in response to the questions posed by their teacher but did not want to share their opinions in front of the class. This showed that their engagement in discussions about science was still limited. They had begun to feel more willing to participate, but they failed to move beyond simply participating in those particular ways that would advance their science learning.

Meaningful engagement in discussion might propagate the notion that differences of opinion are important for discussion in science-learning settings; students need to appreciate that debating contentious matters can facili-

tate learning for all group members without compromising social harmony and friendships if undertaken properly, and they should grasp that science itself proceeds on the basis of conjecture and debate between scientists (Scott et al., 2006). Thus, the notion of social harmony needs to be considered as an aspect of student culture.

From the perspective of culture, it should be noted that harmony has real importance in Javanese culture but might be differently stressed. Javanese culture values those qualities in an individual that contribute to harmonious social integration. Ideal Javanese virtues include obedience to one's superiors (*manut*), generosity, conflict avoidance, understanding others' perspectives, and empathy (Koentjaraningrat, 1985; Magnis-Suseno, 1988). Thus, a teacher must facilitate better learning and encourage students to keep an open mind, helping them to engage in meaningful ways without compromising social harmony and friendships (Anderson, Thomas & Nashon, 2008). This is particularly so because in Javanese culture, students tend to be encouraged to live in harmony with others, develop a consensus, and sustain mutual loyalty (Koentjaraningrat, 1985; Magnis-Suseno, 1988) rather than engaging in criticism, practicing critical and independent thinking, and tolerating ambiguity. Social harmony and security must be maintained (Mulder, 1992). Very often, conflict cannot be prevented or avoided due to objective interest constellation, but what the Javanese want is for such conflict not to be manifested disruptively (Magnis-Suseno, 1988). Furthermore, open confrontation in the form of emotional behavior is regarded as undesirable and as endangering the lives of individuals in a society; therefore, it must be prevented.

However, attempts to maintain social harmony are often made at the expense of rigorous critical thinking and critiques, the consideration of multiple perspectives, and the development of alternative ideas, all of which are recognized as precursors and/or pathways to meaningful science learning and the use of higher-order thought processes (Anderson et al., 2009). By listening to

their own discourse in groups, students were able to begin clearly articulating their roles and thought processes within the group and explain in detail the extent to which and manner in which such roles and functions contributed to group activity. Moreover, they were able to identify and influence the deliberate social and cognitive strategies that they employed to maintain group harmony and managed their learning and task functions.

Conclusion

The findings revealed that incorporating students' funds of knowledge in teaching science not only sustained but also improved students' interest in science. Students felt that approaching science concepts in the context of their everyday life made those concepts more understandable and interesting. Examining the changes on students' interests and attitudes about science show that this teaching strategy helps to develop and sustain students' interest.

The most interesting activities during group work and or discussion were those that were relevant to everyday life and required student conclusions regarding or explanation of a topic. These sorts of activities helped students to better understand the concepts being discussed and encouraged them to engage in problem-solving for activities that they felt were not interesting before this teaching method was first applied. For students to acquire more complete knowledge in this way they are better able to verify equations and understand how to use such equations in solving problems.

Some students who articulated a wish for more discussions during science lessons may be communicating something more fundamental than a preferred approach to teaching science. Opportunities for discussion could actually represent a challenge to authority, with students insisting that their voices be heard. This could be seen as a particular manifestation of broader intellectual changes under the rubric of constructivism.

Teaching methods that incorporate students' funds of knowledge made students feel engaged, excited, and even challenged. This teaching process made the concepts being taught seem more relevant to everyday life and made them easier to understand. Students' experiences showed them the relevance of the topic at hand and increased their awareness about relationship between science and human existence.

Sustained interest in learning science emerged during this study; the results show increasingly more interest and more positive attitudes towards science by the students, with a significant difference over time in mean scores for interests and attitudes. These findings indicate that there was an improvement in students' attitudes and an increase in students' interest during the period of this study.

In summary, teachers used students' accumulated funds of knowledge, themselves culturally anchored (González & Moll, 2002), to encourage them to truly engage in science learning. The teachers are valuable resources for the schools that participated in this study because they have the ability to connect their teaching with the social and cultural resources of their students (González & Moll, 2002) and utilize those resources to support their students, who themselves embody diversity. The findings of this study reveal that the "compatibility" between students' lived experiences, their funds of knowledge, and science concepts can be a major factor in sustaining science learning in school. Once students experience science instruction in this fashion, they are more likely to think critically about science and shared experiences because they can discuss their experiences in an environment that supports their input.

The results of this study indicate the complexity of learning environments and indicate that students' interest levels can be influenced by their surroundings, including household, social, and community culture. These results indicate that science education needs to shift and become more contextual and

relevant, so students can have the opportunity to understand and appreciate what they are learning about, thus develop and sustain an interest in science.

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A STUDY ON THE RELATIONSHIP BETWEEN ATTITUDE TOWARDS THE COMPUTER AND LEARNING STRATEGIES IN TERMS OF SOME VARIABLES[1)]

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Abstract. The aim of this study is to investigate the relationship between computer attitudes and learning strategies. Study group of the research consists of 195 candidate teachers (77 male, 118 female) from Education Faculty of Selcuk University. The research data were gathered from Computer Attitude Scale, Cognitive Learning Strategies Scale, Metacognitive Learning Strategies Scale and Personal Data Form. The research findings are: candidate teachers have medium level computer attitudes, a significant correlation between computer attitude, cognitive and metacognitive learning strategies, candidate teachers who have low computer attitude uses more cognitive and metacognitive learning strategies, male candidate teachers have higher level of computer attitudes than female candidate teachers, female candidate teachers use more cognitive learning strategies, a significant difference in cognitive

learning strategies of candidate teachers' according to the type of the high school graduated.

Keywords: computer attitude, cognitive learning strategies, metacognitive learning strategies, prospective teachers

Introduction

Rapid and intensive developments experienced in information and communication technologies in the 21st century are felt in all areas of our lives. This is so much so that today there are almost no areas where computers have not entered. Therefore, individuals living today need to be able to use computers in order to lead their lives in an efficient way within the society, contribute to social life and continue their personal development. However, individuals develop a reaction against innovations for which they do not possess the skill to use and thus resist change. Prospective teachers, who are to be teachers in the future, must themselves adopt the changes first and become well-informed of the developments in computer technology so that they can apply the changes in institutions of education (Çelik & Bindak, 2005). As the reasons that prospective teachers' attitude towards computers plays a determining role in their use of the computer in educational activities. In this context, it should be ensured that prospective teachers who will educate future generations are able to use the computer in an effective way and develop a positive attitude towards it.

At the same time, prospective teachers should be equipped with the ability to improve themselves and learn by themselves so that they can be successful both during their education process and after their education. In other words they should acquire the proficiency to learn by themselves and monitor their learning in order to develop themselves at this age of information. In this context, it can be stated that prospective teachers' acquiring the proficiency to learn by themselves and monitor their learning is linked to the learning strategies they use. Learning strategies are the techniques, principles or habits that enable can-

didate teachers to fulfill their own learning tasks independently (Sünbül, 1998). Weinstein & Mayer (1986) defined learning strategies as behavior or thoughts in a learning case that are expected to influence the processes of students' acquiring information, encoding it in the memory and retrieve it when necessary, and ways by which students guide themselves in the process of learning and acquire independent learning skills.

There are many studies in the relevant literature about attitudes towards the computer. While some of these studies concern efforts to develop scales of attitude towards the computer (Aşkar & Orçan, 1987; Bindak & Çelik, 2006; Jones & Clarke, 1994; Loyd & Gressard, 1984; Selwyn, 1997; Yeşilyurt & Gül, 2007), others studies include research into attitude towards the computer in terms of different variables. The number of studies that explore the attitude towards the computer and learning strategies together are quite limited (Steele et al., 2002; Tsai & Tsai, 2003). Teachers need to exhibit a positive attitude towards the computer for a successful implementation of the information and communication technologies in learning environments. For a computer activity to succeed, it is important that those, who implement it, to have favorable views regarding the parts that constitute it. In this context, revealing of attitudes may render it possible to predict and control behavior of individuals and take necessary precautions. Besides attitude, how the student processes information is also important. Therefore, it is believed that especially learning strategies that students use in computer-related courses may influence their attitudes towards the computer. Moreover, it can be argued that an investigation into the relationships between the strategies that students with high and low attitudes towards the computer is important to know students better and compensate for their shortcomings by taking the necessary precautions. In this context, the purpose of this study is to investigate the relationship between the attitudes of candidate teachers towards the computer and their learning strategies in terms of certain variables. To this end, answers were sought for the following questions in the study:

(i) Is there a relationship between attitudes towards the computer and learning strategies? (ii) Do learning strategies of candidate teachers vary on the basis of their attitudes towards the computer? (iii) Do prospective teachers' attitudes towards the computer and their learning strategies vary according to their gender; type of high school they graduated from; their reasons for choosing teaching as a career; whether they chose the profession of their own volition or not; to what extent the teaching profession is fitting for them - what they feel when they think about the future of their profession?

Method

In this study, which attempted to determine the relationship between prospective teachers' attitudes towards the computer and their learning strategies in terms of certain variables, single and relational survey models were used. While an attempt was made to describe the personal information about the candidate teachers using the single survey model, the relationship between candidate teachers' attitudes towards the computer and their learning strategies was described in terms of certain variables using the relational survey model.

The study group

The study group consisted of a total of 195 students studying at Selcuk University Ahmet Kelesoglu Education Faculty in the 2008-2009 academic years, of whom 77 were male and 118 were female. Of the students in the study group, 61 graduated from General High School, 46 from Anatolian Teachers High School, 55 from Anatolian High Schools, 26 from Super High Schools, 2 from Science High Schools and 5 from other high schools. While 151 of the students had chosen the teaching career of their own volition, 44 of them had chosen this profession of not their own volition. 44 of the students stayed with their families and 42 with their friends while 109 of them stayed in a dormitory.

Data collection tools

Computer Attitude Scale, Cognitive Learning Strategies Scale, Meta-cognitive Learning Strategies Scale and Personal Information Form were used in order to seek answers to the sub-goals in accordance with the purpose of the study.

Computer Attitude Scale: It is a single-dimension Likert-type scale consisting of 22 items developed by Bindak & Çelik (2006) to determine candidate teachers' attitudes towards the computer. The lowest score that can be taken from the scale is 22 whereas the highest score is 110. The internal consistency coefficient of the scale is 0.91.

Cognitive Learning Strategies Scale: It is a four-step Likert-type scale developed by Gürcan (2005) consisting of 36 items. The lowest score that can be taken from the scale is 36 and the highest score is 144. The internal consistency coefficient of the whole scale is 0.89. The scale contains six sub-dimensions, namely application, memory, analysis, summarizing, repetition and description strategies.

Meta Cognitive Learning Strategies: It is a four-step Likert-type scale developed by Namlu (2004) consisting of 21 items. 18 items of the scale are positive while 3 items are negative. The internal consistency coefficient of the whole scale is 0.81. The scale has four sub-dimensions, namely planning, organizing, supervising (checking) and evaluating strategies.

Personal Information Form: It contains survey items such as gender and type of high school they have graduated from that will help learn about candidate teachers in the study group and obtain information that will be related to the attitude towards the computer and learning strategies scales.

Data collection

The data collection tool was prepared by bringing together Computer Attitude Scale, Cognitive Learning Strategies Scale, Meta-cognitive Learning

Strategies Scale and Personal Information Form, which were to be used as data collection tools in the study, and sufficient numbers of their copies were made. The copies of the data collection tools were administered to students who were enrolled in Selcuk University Ahmet Kelesoglu Education Faculty and were in class on the dates of application between April 13 and 17, 2009. During the application process, 205 students completed the data collection tools but 19 data collection tools were excluded from the scope of the study as they were completed inappropriately.

Data analysis

The responses that the candidate teachers gave to the data collection tools were analyzed appropriately in order to answer the questions aimed at the purpose of the study. To this end, correlation analysis was performed to seek an answer to the sub-problem of whether there was a relationship between the attitude towards the computer and the learning strategies, while variance analysis was performed to find an answer to the sub-problem of whether candidate teachers' learning strategies varied according to the levels of their attitudes towards the computer. On the other hand, whether the candidate teachers' attitudes towards the computer and their learning strategies varied according to their gender, whether they have chosen the profession of their own volition or not, and what they felt when they considered the future of the profession was tested using the t-test wheras whether they varied according to the type of the high school they graduated from, their reasons for selecting the profession and whether the teaching profession was fitting for them or not was tested by performing variance analysis. When a difference emerged as a result of the variance analysis, multiple comparison tests were performed in order to determine from which group or groups this difference emerged.

Findings

Before seeking answers to the sub-goals of the study, the level of the candidate teachers' attitudes towards the computer was determined. For this purpose, the values obtained from the defining statistics are given in Table 1.

Table 1. Prospective teachers' attitudes towards the computer

	n	Lowest	Highest	$\overline{X}$	Sd
Attitude towards computers	195	22	110	46.07	12.09

According to the results obtained from the scale, students with a score which is one standard deviation level below the mean score were ranked the low group, students with a score which is one standard deviation level above the mean score were ranked the high group and students with a score between the two groups were ranked the middle group. According the emerging distribution; the low group had scores below 34 (low level), the middle group had scores between 35 and 38 (medium level) and the high group had scores above 59 (high level). According to this distribution, the number of candidate teachers in the low level group was determined to be 33, while the number of candidate teachers in the middle group was 140 and the number of the candidate teachers in the high group was 22. According to this result, it can be argued that the attitude of the candidate teachers towards the computer is at a medium level.

An attempt was made to determine the relationship between candidate teachers' attitudes towards the computer and their cognitive and meta-cognitive learning strategies by performing a correlation analysis. The results that were obtained are shown in Table 2.

Table 2. Relationship between attitude towards the computer and learning strategies

Variables	n	r	p
Attitude-Cognitive Learning Strategies	195	-0.233	0.001*
Attitude-Meta-cognitive Learning Strategies	195	-0.245	0.001*

*$p<0.01$

As can be seen from the table, there is a low level and reverse relationship between students' attitudes towards the computer and their cognitive learning strategies and meta-cognitive learning strategies and this relationship is significant ($p<.05$). Therefore, as students' attitudes towards the computer increase, then the learning strategies they use decrease.

Whether candidate teachers' learning strategies varied according to the levels of their attitudes towards the computer or not were tested by performing variance analysis and if a difference was observed among the groups Tukey test was conducted to determine which group or groups this difference emerged from. Results of the analysis are given in Table 3.

Table 3. Results of the variance analysis on levels of candidate teachers' attitudes towards the computer and their learning strategies

Variables	Source of Variance	Total of Squares	Degree of Freedom	Mean of Squares	F	p	Difference
Cognitive Learning Strategies	Intragroup	975.653	2	487.827	3.213	.042	
	Intergroup	29154.326	192	151.845			Low-High
	Total	30129.979	194				
Meta Cognitive Learning Strategies	Intergroup	529.353	2	264.677	4.318	.015	
	Intragroup	11769.293	192	61.298			Low-High
	Total	12298.646	194				

As is seen in Table 3, there is a significant difference between the levels of candidate teachers' attitudes towards the computer and their cognitive learning strategies ($F_{(2-192)}= 3.213$; $p<.05$). This difference arises from students with a low level of attitude towards the computer and students with a high level of

attitude towards the computer. In other words, candidate teachers' cognitive learning strategies vary according to the levels of their attitudes towards the computer. Students with a lower level of computer attitude use more cognitive learning strategies. Likewise, there is a significant difference between the levels of candidate teachers' attitudes towards the computer and their meta-cognitive learning strategies ($F_{(2-192)}$= 4.318; p<.05). This difference arises from students with low levels of computer attitudes and students with high levels of computer attitudes. In other words, candidate teachers' meta-cognitive learning strategies vary according to the levels of their attitude towards the computer. Students with lower levels of computer attitudes use more meta-cognitive learning strategies.

Whether candidate teachers' attitudes towards the computer and their learning strategies vary according to their gender was tested using the t-test. Results of the analysis are given in Table 4.

Table 4. T-test results of candidate teachers' attitudes towards the computer and their learning strategies according to their gender

Variable	Groups	n	$\overline{X}$	Sd	df	t	P
Attitude Towards the Computer	Girl	118	43.73	12.82	193	-2.21	0.03
	Boy	77	47.60	11.40			
Cognitive Learning Strategies	Girl	118	94.25	11.78	193	-2.02	0.05
	Boy	77	90.60	13.22			
Meta Cognitive Learning Strategies	Girl	118	56.09	7.79	193	-1.34	0.19
	Boy	77	54.53	8.18			

As a result of the t-test that was performed, a difference of 3.34 points was found between male and female candidate teachers' scores on attitude towards the computer in favor of male candidate teachers (t= -2.21; p<.05). In other words, male candidate teachers' scores regarding their attitude towards the computer are higher in comparison to those of the female candidate teach-

ers. According to this result, it can be suggested that male candidate teachers have a more positive attitude towards the computer than female candidate teachers. However, a difference of 3.65 points was found between male and female candidate teachers' cognitive learning strategy scores, the difference being in favor of female candidate teachers (t= -2.02; p<.05). To put it in another way, female candidate teachers' scores on cognitive learning strategies are higher in comparison to those of male candidate teachers. According to this result, it can be proposed that female candidate teachers use cognitive learning strategies more than male candidate teachers. However, there was no significant difference between male and female candidate teachers' meta-cognitive learning strategies (t= -1.34; p>.05). In other words, meta-cognitive learning strategies of male and female candidate teachers are similar.

Whether candidate teachers' attitudes towards the computer and their learning strategies varied according to the type of high school they graduated from was tested by performing variance analysis, and if a difference arose between the groups, then Tukey test was conducted to determine from which group or groups this difference arose. Results of the analyses are given in Table 5.

As is seen from Table 5, there is no significant difference between the types of high school which candidate teachers graduated from and the levels of their attitudes towards the computer ($F_{(5-189)}$=1.10; p>.05). In other words, candidate teachers' attitudes towards the computer are similar in terms of the types of high schools they graduated from. There is a significant difference between the types of high schools that students graduated from and their cognitive learning strategies ($F_{(5-189)}$=4.87; p<.05). This difference arises from students from General High Schools ($\overline{X}$ = 95.13) and students from Anatolian Teachers' High School ($\overline{X}$ = 85.63); students from Anatolian Teachers' High School ($\overline{X}$ = 85.63) and students from Anatolian High Schools ($\overline{X}$ =94.18); and students

from Super High Schools ($\overline{X}$ = 97.65) and students from Anatolian Teachers'
High School ($\overline{X}$ = 85.63). In other words, students from Anatolian Teachers'
High School use fewer cognitive learning strategies than students from General
High Schools, Anatolian High Schools and Super High Schools. However, no
significant difference was found between the types of high schools that candidate teachers graduated from and their metacognitive learning strategies ($F_{(5-189)}$= 2.17; p>05). In other words, metacognitive learning strategies that candidate teachers use are similar in terms of the types of high schools they graduated from.

Table 5. Results of the variance analysis regarding prospective teachers' attitudes towards the computer and their learning strategies according to the type of high school they graduated from

Variables	Source of Variance	Total of Squares	Degree of Freedom	Mean of Squares	F	p	Difference
Attitude Towards the Computer	Intergroup	802.44	5	160.49	1.10	.362	
	Intragroup	27574.55	189	145.90			
	Total	28376.99	194				
Cognitive Learning Strategies	Intergroup	3436.95	5	687.39	4.87	.001*	GHS-ATHS
	Intragroup	26693.04	189	141.23			ATHS- AHS
	Total	30129.98	194				ATHS-SHS
Metacognitive Learning Strategies	Intergroup	668.75	5	133.75	2.17	.059	
	Intragroup	11629.89	189	61.53			
	Total	12298.65	194				

GHS: General High Schools
ATHS: Anatolian Teachers' High School
AHS: Anatolian High Schools
SHS: Super High Schools

Whether candidate teachers' attitudes towards the computer and their
learning strategies varied according to their reasons for choosing the teaching
profession was tested by performing variance analysis, and if a difference arose
among the groups, Tukey test was conducted to determine from which group or
groups this difference arose. Results of the analyses are given in Table 6.

Table 6. Results of the variance analysis on prospective teachers' reasons for choosing the teaching profession and their attitudes towards the computer and their learning strategies

Variables	Source of Variance	Total of Squares	Degree of Free-dom	Mean of Squares	F	p	Difference
Attitude To-wards the Computer	Intergroup	764.25	4	191.06	1.32	.266	
	Intragroup	27612.75	190	145.33			
	Total	28376.99	194				
Cognitive Learning Strategies	Intergroup	2496.03	4	624.01	4.29	.002	ILP-MyScore
	Intragroup	27633.96	190	145.44			
	Total	30129.98	194				ILP-Other
Metacognitive Learning Strategies	Intergroup	935.684	4	233.921	3.91	.004	ILP-MyScore
	Intragroup	11362.96	190	59.81			
	Total	12298.65	194				ILP-Other

ILP : "I love the profession"
MyScore: "my score was enough only for this department"

As is seen from Table 6, there is no significant difference between candidate teachers' reasons for choosing the teaching profession and the levels of their attitudes towards the computer ($F_{(4-190)}$=1.31; p>.05). In other words, candidate teachers' attitudes towards the computer are similar in terms of their reasons for choosing the profession. There is a significant difference between candidate teachers' reasons for choosing the profession and their cognitive learning strategies ($F_{(4-190)}$= 4.29; p<.05). This difference arises from students who stated "I love the profession" ($\overline{X}$ = 96.15) and who stated "my score was enough only for this department" ($\overline{X}$ = 89.31), and those who stated "I love the profession" ($\overline{X}$ = 96.15) and those who stated "other" ($\overline{X}$ = 87.60). A similar situation also holds true for metacognitive learning strategies. In other words, there is a significant difference between candidate teachers' reasons for choosing the profession and their metacognitive learning strategies ($F_{(4-190)}$= 3.91; p<.05). This difference arises from students who stated "I love the profession" ($\overline{X}$ = 57.25) and those who stated "my score was enough only for this department ($\overline{X}$ = 53.06),

and students who stated "I love the profession" ($\overline{X}$ = 57.25) and those who stated "other" ($\overline{X}$ = 52.39).

Whether candidate teachers' attitudes towards the computer and their learning strategies varied according to their choosing the profession of their own volition or not was tested using the t-test. Results of the analysis are shown in Table 7.

Table 7. T-test results regarding prospective teachers' attitudes towards the computer and their learning strategies according to whether they chose the profession of their own volition or not

Variable	Group	n	$\overline{X}$	Sd	Df	t	p
Attitude Towards the Computer	Yes	151	45.11	10.66	193	-1.68	.09
	No	44	49.36	15.79			
Cognitive Learning Strategies	Yes	151	94.50	11.91	193	3,61	.00
	No	44	87.02	12.72			
Metacognitive Learning Strategies	Yes	151	56.28	7.82	193	2,64	.01
	No	44	52.73	7.90			

As a result of the t-test that was performed, no difference was found between the scores of candidate teachers regarding their attitudes towards the computer whether they chose the profession of their own volition or not (t= -1.68; p>.05). In other words, scores of candidate teachers regarding their attitudes towards the computer are similar no matter whether they chose the profession of their own volition or not. There was a difference of 7.47 points between the cognitive learning strategy scores of candidate teachers who chose the profession of their own volition and those who did not, the difference being in favor of candidate teachers who chose the profession of their own volition (t= 3.61; p<.05). In other words, cognitive learning strategy scores of candidate teachers who chose the profession of their own volition are higher in comparison to those who did not choose the profession of their own volition. According to this result, it can be stated that candidate teachers who chose the profession of their own volition use cognitive learning strategies more than those who did

not choose the profession of their own volition. A similar situation also holds true for metacognitive learning strategies. There was a significant difference of 3.55 points between the metacognitive learning strategy scores of candidate teachers who chose the profession of their own volition and those who did not, the difference being in favor of candidate teachers who chose the profession of their own volition (t= 2.64; p<.05). To put it in another way, metacognitive learning strategy scores of candidate teachers who chose the profession of their own volition are higher than those of the candidate teachers who did not choose the profession of their own volition. According to this result, it can be stated that candidate teachers who chose the profession of their own volition use metacognitive learning strategies more than candidate teachers who did not choose the profession of their own volition.

Whether candidate teachers' attitudes towards the computer and their learning strategies varied according to the extent to which the teaching profession was fitting for them was tested by performing variance analysis, and if a difference arose among the groups, Tukey test was conducted to determine from which group or groups this difference arose. Results of the analysis are given in Table 8.

As is seen in Table 8, there is no significant difference between how fitting the teaching profession is for candidate teachers and their attitudes towards the computer ($F_{(2-192)}$= 2.57; p>.05). In other words, candidate teachers' attitudes towards the computer are similar in terms of whether the teaching profession is fitting for them or not. There is no significant difference between how fitting the teaching profession is for candidate teachers and their cognitive learning strategies ($F_{(2-192)}$= 7.62; p<.05). This difference arises from students who consider the profession fitting for them ($\overline{X}$ = 95.26) and those who consider it partially fitting for them ($\overline{X}$ = 84.16). A similar situation also holds true for metacognitive learning strategies. In other words, there is a significant difference between how fitting the profession is for candidate teachers and their met-

acognitive learning strategies ($F_{(2-192)} = 6.96$; p<.05). This difference arises from students who consider the profession fitting for them ($\overline{X} = 56.94$) and those who consider it partially fitting for them ($\overline{X} = 49.33$).

Table 8. Results of variance analysis regarding how fitting the teaching profession is for students and their attitudes towards the computer and their learning strategies

Variables	Source of Variance	Total of Squares	Degree of Freedom	Mean of Squares	F	p	Difference
Attitude Towards the Computer	Intergroup	739.46	2	369.73	2.57	.08	
	Intragroup	27637.53	192	143.95			
	Total	28376.99	194				
Cognitive Learning Strategies	Intergroup	2215.75	2	1107.87	7.62	.01	Fitting-Partially Fitting
	Intragroup	27914.23	192	145.39			
	Total	30129.98	194				
Metacognitive Learning Strategies	Intergroup	830.96	2	415.48	6.96	.01	Fitting-Partially Fitting
	Intragroup	11467.70	192	59.73			
	Total	12298.65	194				

Whether candidate teachers' attitudes towards the computer and their learning strategies varied according to how they felt when they considered the future of their profession was tested using the t-test. Results of the analysis are given in Table 9.

As a result of the t-test, a difference of 5.46 points was found between the candidate teachers who felt themselves optimistic and those who felt pessimistic in terms of their scores regarding their attitudes towards the computer, the difference being in favor of the candidate teachers who felt themselves pessimistic (t= -2.20; p<.05). In other words, scores of candidate teachers who felt themselves pessimistic were higher than those of candidate teachers who felt themselves optimistic in terms of their attitudes towards the computer. According to this result, it can be stated that candidate teachers who felt themselves pessimistic had a more positive attitude towards the computer than teachers

who felt themselves optimistic. However, a difference of 6.57 points was found between the cognitive learning strategy scores of candidate teachers who felt themselves optimistic and those who felt pessimistic (t= 2.58; p<.05) and a difference of 3.99 points between their metacognitive learning strategy scores (t= 2.45; p<.05), both in favor of candidate teachers who felt themselves optimistic. In other words, cognitive and metacognitive strategy scores of candidate teachers who felt themselves optimistic are higher than those candidate teachers who felt themselves pessimistic. According to this result, it can be suggested that candidate teachers who felt themselves optimistic use cognitive and metacognitive learning strategies more than candidate teachers who felt themselves pessimistic.

Table 9. T-test results regarding students' attitudes towards the computer and their learning strategies according to what they felt when they considered the future of their profession

Variables	Group	n	$\overline{X}$	Sd	Df	t	p
Attitude Towards the Computer	Optimistic	168	45.32	11.76	193	-2.20	.03
	Pessimistic	27	50.78	13.28			
Cognitive Learning Strategies	Optimistic	168	93.72	12.14	193	2,58	.01
	Pessimistic	27	87.15	13.20			
Metacognitive Learning Strategies	Optimistic	168	56.03	7.87	193	2,45	.02
	Pessimistic	27	52.04	7.80			

Discussion

The present study, which aimed at determining the relationship between prospective teachers' attitudes towards the computer and their learning strategies, found that students' attitudes towards the computer were at a medium level. A similar finding was also reached in a study which was conducted by Gerçek et al. (2006). According to this result, it can be suggested that various activities need to be implemented in order to raise the attitudes of prospective teachers who will educate future generations and set examples regarding infor-

mation and communication technologies towards the computer. The study found a significant but reverse relationship between attitude towards the computer and cognitive and metacognitive learning strategies. It was determined that students' cognitive and metacognitive learning strategies varied according to their attitudes towards the computer; in other words, prospective teachers with a lower level of attitude towards the computer used more cognitive and metacognitive learning strategies. It can be suggested that one reason why such a result emerged was that students who had little interest in the computer attached more importance to other courses that were not related to the computer and therefore used more learning strategies.

When students' attitudes towards the computer were investigated in terms of their gender, it was observed that male candidate teachers had a higher level of attitude than female candidate teachers. This finding of the present study is also supported by some studies in the relevant literature (Colley et al, 1994; Loyd & Gressard, 1984; Roussos, 2002; Whitley, 1997). However, a large majority of the studies in the literature[2-4] (Çekbaş et al., 2003; Çelik & Bindak, 2005; Güler & Sağlam, 2002) do not support this finding. This result can be attributed to the difference in the numbers of participants by gender or students' experiences with the computer in the past. In this context, it can be proposed that different studies need to be implemented in order to reveal the causes of this difference. It was found that candidate teachers' attitudes towards the computer did not vary according to the type of high school that they graduated from. This finding of the study is also supported by a study conducted by Gerçek et al. (2006). This result can be attributed to the computer courses that students took before their undergraduate studies began.

The study also found that students' cognitive learning strategies varied according to the type of the high school that they graduated from. Interestingly enough, students from Anatolian Teachers' High School, in particular, used fewer cognitive learning strategies than students who graduated from other high

schools. This result can be attributed to the pedagogical courses that students who graduated from Anatolian Teachers' High School received before they became candidate teachers. In this context, experimental activities can be organized concerning cognitive learning strategies of students from Anatolian Teachers' High School. Moreover, qualitative studies can be designed to determine the factors that caused such a result to emerge.

The study found no significant difference between the reasons why prospective teachers chose the teaching profession and their attitudinal levels towards the computer. This result can be attributed to the fact that information and communication technologies affect all areas today and that it is impossible to achieve success in any job without having computer skills no matter what profession one chooses. However, a totally opposite situation arose in the case of the cognitive and metacognitive learning strategies that candidate teachers used. This result can be attributed to the fact that students chose the profession not because their score were sufficient for this department but because they chose it of their own volition, they believed that they could perform this profession successfully in the future, have their heart in the profession and hence make use of cognitive and metacognitive learning strategies in courses required for the teaching profession. A similar situation also holds true for candidate students who consider the teaching profession fitting for themselves. In other words, students who consider the profession fitting for themselves use more cognitive and metacognitive learning strategies.

Another finding of the study is that while the attitudes towards the computer of prospective teachers who felt themselves pessimistic when they considered the future of their profession were higher, they used fewer cognitive and metacognitive learning strategies. This result can be attributed to the fact that candidate teachers who feel themselves pessimistic are aware that perhaps they will not be in the teaching profession in the future but that they can't be successful in another job without computer skills. In this context, more detailed

studies need to be implemented regarding the reasons for whether candidate teachers choose the profession of their own volition or not, whether they consider the profession is fitting for themselves or not and how these affect individual differences.

NOTES

1. Short version of this research (in Turkish) was presented at the International Balkan Education and Science Congress in Edirne, October 2009.

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4. http://ietc2008.home.anadolu.edu.tr/ietc2008/46.doc

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IMPROVING FLEXIBILITY AND ACCESSIBILITY OF HIGHER EDUCATION WITH WEB 2.0 TECHNOLOGIES: NEEDS ANALYSIS OF PUBLIC HEALTH EDUCATION PROGRAMS IN BULGARIA

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Abstract. The case study presented in this paper aims to address the issues related to the use of Web 2.0 technology in public health education in a particular college in Bulgaria in relation to providing flexible and accessible education consistent with the current trends in public health practices. The outcomes of the case study suggest that systematic steps are needed in order to assure effective inclusion of technology into the learning process; these steps include the completion of systematic studies of attrition rate and the reasons for student drop-out, training of administration and faculty members in effective incorporation of Web 2.0 technologies, introduction and promotion of Medicine 2.0 practices, and initiating the planning of design and development

of Web 2.0 learning applications and environments in Bulgarian which is the language of instruction.

Keywords: Web 2.0, Medicine 2.0, Public Health education, education flexibility & accessibility

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Introduction

Today, seven years after the term "Web 2.0" was defined, the Internet continues to expand its capability to inform and connect people, to provide them with opportunities to form communities, co-develop applications, discourses, and knowledge. There are various definitions of Web 2.0; however, all of these definitions highlight improved communication flexibility and the increased interaction of users through Web 2.0 applications as the key attributes (Van De Belt et al., 2010), furthermore, Web 2.0 technologies are characterized by "creating network effects through an "architecture of participation" (O'Reily, 2007).

The transformative power of Web 2.0 technologies and the practices that emerged with them changed the expectations of users. Today technologies allow immediate responsiveness and flexible access to various types of information, including health information. Researchers in the field of medical studies (Eysenbach, 2008; Madl & Kohane, 2008) point out that programs such as Personal Health Application Platforms reconstruct patients and health workers involvement "as the gravity shifts away from health care providers as the sole custodian of medical data" (Eysenbach, 2008). These dynamic changes brought a new concept in the medical nomenclature: Medicine 2.0. It presents "the use of specific set of Web tools (blogs, Podcasts, tagging, search, wikis, etc) by actors in health care including doctors, patients, and scientists, using principles of open source and generation of content by users, and the power of networks in order to personalize health care, collaborate, and promote health education" (Hughes et al., 2008). One of the main structuring

themes of Medicine 2.0, defined by Hughes et al. (2008), is the educational significance of Medicine 2.0 both for general public education and professional training. Undoubtedly, such dramatic changes in the health practice pose new demands on higher education in the field of medicine, including training public health professionals. Therefore, today there is a great need for strategic planning for educating public health workers in a way that would allow them to fully participate in Medicine 2.0 communities. Undoubtedly, the Web 2.0 networks, including the networks within the Medicine 2.0 scope, tend to have a global impact; nonetheless, it is crucial to understand the specifics of particular educational settings in order to plan the training of public health professionals accordingly. Recognizing the specifics of educational setting would allow for building on existing traditions while guiding educators and learners towards the newly emerging Web 2.0 and Medicine 2.0 practices.

This paper presents an exploratory case study of a Bulgarian college which, being part of a large medical university, trains professionals in the field of Public Health (PH) and Health Care (HC). This is an exploration of the current issues related to the accessibility of the college programs and the implementation of Web 2.0 technologies in the college. We view this second issue to be directly related both to the accessibility and the provision of education relevant to the current trends of development in the field. Based on this exploration, we aim to identify specific steps that would support the development of effective educational practices in this college and will inform similar educational institutions in Bulgaria.

When defining the focus of this study, we were guided by two interrelated aspects affecting the educational processes in the European Union and around the globe: the vast influence of the constantly developing communication technologies and the efforts to promote "mobility by overcoming obstacles to the effective exercise of free movement with particular attention to… [student] access to study and training opportunities and to related services".[1]

The study has been conducted as part of an Erasmus multilateral project WebWise: Web 2.0 Supported Higher Education Institutional Learning Scenarios for Collaborative Learning; the goal of the project is to facilitate the improvement of the efficiency and accessibility to Public Health Higher Education (PHE) through the structure of the Bologna Process and the inclusion of innovative methodological collaborative Web 2.0 learning tools. The research questions posed in the study were: (1) What organizational strategies are used to assure flexibility and accessibility of the education at the College; (2) How e-learning, including Web 2.0 technologies, is viewed by college administration, instructors, and learners; (3) To what extent are Web 2.0 technologies presented in the College? Why are they presented in this way and what factors determine this presentation.

Methods

In order to develop a better understanding of the current state of public health education in Bulgaria and propose specific actions that would support program flexibility and accessibility as well as effective and meaningful inclusion of Web 2.0 technologies in PHE, an exploratory case study was conducted (Yin, 2003). The data were collected through document research and series of semi-structured interviews (Patton, 2002) with stakeholders from the targeted college, the analysis focused on: (1) existing teaching and learning practices with consideration of flexibility and accessibility of education and (2) readiness for inclusion of technologies, including Web 2.0 technologies into the learning process. Based on the outcomes, approaches for further steps for supporting the accessibility and flexibility of the programs and incorporation of Web 2.0 technologies into the learning and teaching practices are proposed.

Settings

The Broad context: the health care system in Bulgaria

There have been numerous reforms in the field of health care in Bulgaria since 1990s. During this period, the centralized health care system inherited from the 1980ies socialist period started undergoing various changes in order to meet the new economic and political realities in the country. These reforms impacted the way the health system is financed, delivers services, defines users and providers, determines the relationships between them, and reorganizes the health care facilities. Fig. 1 presents an overview of the reformed health care system.[2]
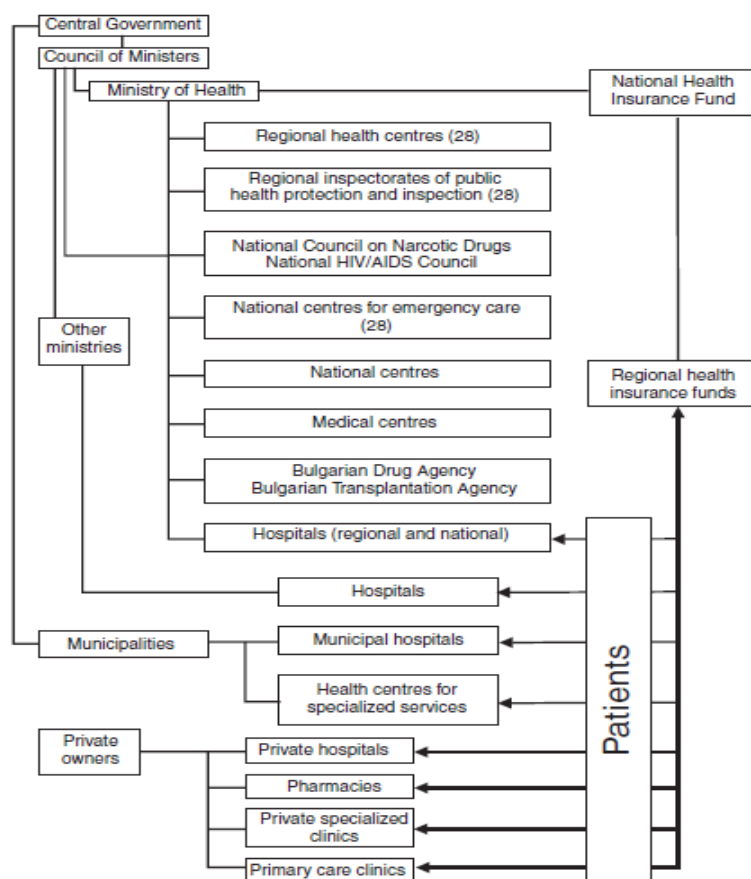
Fig. 1. Overview chart of the health system

In 1998, after the Parliament introduced the Health Insurance Act, the national compulsory health insurance which provides basic health care services to the insured population was adopted.[2)]

In terms of providing PHE, there are various pathways which are all presented in the context of university higher education. Currently in Bulgaria there are five universities which offer public health programs at different levels: the Medical Universities of Sofia, Varna and Plovdiv, the Medical School in Pleven, and the Trakia University Medical School.

These universities offer education at bachelor, master, and doctoral level. The programs are either offered by the university faculties at a bachelor, master, and doctoral level or by colleges affiliated to the university at a professional bachelor level. The difference between the bachelor and professional bachelor educational level is that the professional bachelor programs are to a greater extent oriented towards acquiring practical professional skills, in addition, the number of credits required for obtaining the degree is lower (185) as compared to the bachelor programs (240+).

Within the professional context, there are two professional categories different from medical care – public health and health care. Respectively, there are two types of educational programs that prepare specialists of these categories: classified either as public health programs or health care programs. These programs prepare specialists for the professional categories: (1) public health – which includes professionals from the following fields - *health management, nursing, obstetrics, and occupational medicine*, and (2) health care – the professional fields in this category are: *dental technicians, massage therapists, rehabilitators, assistant pharmacists, sanitary inspectors, social workers, medical cosmeticians, and x-ray laboratory assistants*. In the context of this study, we will consider both categories as sub-categories of the broader category PH.

Both, public health and health care educational programs require accreditation according to the Law for Higher Education in Bulgaria. In this accreditation, various factors related to entry criteria, curriculum, and exit criteria are considered. In general, the entry criteria for the accredited bachelor's programs are high school diploma and oral or written examination. The exit criteria are based on the skills that are defined in the national professional descriptions. Depending on the type of the program, the curricula can be either regulated by the government or non-regulated. The details of program regulation and curricula are defined in the Act of the Council of Ministers, an example of such documents are the Act N238 of September 26, 2008 (for Health Care programs) and Act N215 of August 18, 2006 (Public Health). Generally, most of the programs are government regulated: 90% of curriculum of the regulated programs is defined by the Act of the Council of Ministers, while the curricula of the non-regulated programs are designed and approved by the educational institution which offers the training. The educational institutions which train PH specialists are subjects of the Ministry of Education, Youth and Science and the Health Care Ministry of Bulgaria.

The College

The specific institution which was researched was a medical college affiliated to one of the medical universities in Bulgaria. In this particular institution only professional bachelor programmes in the field of health care are offered. The college trains dental technicians, massage therapists, rehabilitators, assistant pharmacist, medical cosmetician, and social workers. Following are the general characteristics of learning process organization: (1) *The admission criteria:* High school diploma, entrance examination; (2) *Types of programs and degrees:* All programs are delivered on full-time face-to-face basis. No fast track programs, e-learning or distance programs are offered at the College although the University with which the College is affiliated has a regula-

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tory document defining the parameters for distance learning at the University; (3) *The exit criteria:* The degree awarded upon the completion of the course of study is professional bachelor. The exit criteria are state exit examinations – oral, written, and practice. The results of the state exit examination in combination with the course examination results are considered when the decision about awarding the degree is made; (4) *The professional specifications*: The College graduates are considered to be certified professionals in the field of health care; (5) *Previous professional experience* accounted for in the context of PHE (fast track programs, special programs etc.): No professional experiences are accounted for when admitting students into a program, no specialized curriculum is considered for students with previous experience in the field. Only when a second bachelor degree is being obtained in the same field, certain credits may be transferred; this, however, does not result in a fast track progression through the course of studies, it rather affects the course load for the semester in which the given subjects are offered; (6) *Access to equipment including computers*, courseware, specialized software, servers, and Internet connection: The interview data suggest that at the College the access to professional equipment is adequate for the current needs of the College. However, there is limited access to equipment related to e-learning and e-communication. There is a library computer lab with about 10 computers connected to the Internet while there are 834 students currently enrolled in the college. The college is using the server(s) of the medical university with which it is affiliated. According to the college administrators, there are possibilities to introduce courseware systems in the future, most likely Moodle; however, at this point there is no faculty training being planned and no specific information communicated to college administration and/or faculty members. Finally, only wired internet connection is available in the offices and the library; (7) *Specific curricula requirements*: Most of the programs in the College are regulated, in other words, their curriculum is designed and approved

on a government level in terms of number of credits, ratio between core and elective courses, practicums and internships; (8) *Mobility within and between institutions* (credit transfer): The credits are transferrable between similar and programs within the country, provided that the courses for which credits are transferred have the same or similar curriculum. However, the within institution transfer from one program to another during the course of study is limited or even non-existent due to the different entry examination scores required for the admission into different programmers and the overall program curriculum differences.

Participants

The participants in the case study were representatives of three different groups of stakeholders in the college: (i) the decision makers/administration; this group includes the director, the head of the curriculum and students department, and one of the department chairs. (ii) The academics: five instructors took part in the interviews, two of them were instructors who teach courses in a regulated program and three were instructors from the two unregulated programs offered at the College. (iii) Finally, eight students participated in the interview: six professional bachelor degree students from the two unregulated programs offered at the College and two professional bachelor degree students – from one of the regulated programs.

Educational practices: flexibility and accessibility of the education at the college

Decision Makers

When discussing the accessibility of education at the College, the decision makers described the overall organization of the educational pathway at the College as rather fixed in terms of curricula and policies. They outlined that, due to the regulated nature of most of the programmes offered at the Col-

lege, the requirements are very strict and the adherence to these requirements is a key factor to success in the program. During the interview, the administrators of the College shared the following considerations that shape the learning pathway: (1) One credit is defined as a minimum of 15 hours in-class work and total 25 to 30 hour of work, which requires a full-time dedication on the side of the students during their course of study. (2) In addition, the expectations are that students will be involved in a lot of individualized hands-on learning experiences due to the specifics of their studies which also requires full-time and face-to-face engagement in the learning process. (3) While for the regulated programs the government act specifies the subjects to be included in the curriculum and the number of hours each subject to be studied, the instructor is the one that makes decisions about on the course content and the mode of its delivery (the choice of the teaching and learning sttegies to support the content acquisition) and presents it to the faculty committee for approval. (4) During the semesters in which electives are planned, students can choose from at least two electives (four totals for the course of study); the core courses are regulated; the electives are proposed by the instructors and approved by the faculty committee. In the regulated programs curricula, the elective courses cannot be more than 10% of the overall curriculum.

In this context, according to the College administration, the main barrier is the lack of schedule flexibility and the attendance strictness of the programmes offered at the College. For example, during one semester, the instructor of a given course may allow one absence in exceptional circumstances; two absences are reported to the head of the program, and more than two – to the director of the college who decides on how to proceed with each particular case.

This makes the programs less accessible for students who hold full-time jobs and/or have families because they have to fully devote themselves to their studies. In addition, the interviewed administration representatives

shared their general observations that demographics of the students are changing rapidly in the past years and more "non-traditional" students who have families and change carriers are joining the college programs. We could not obtain more specific information about these changes because no systematic studies of how exactly student demographics change were conducted at the college. If we accept the administrators' observation on the demographic changes, it would suggest that the needs of the "non-traditional" student population in terms of flexibility and accessibility are not met at all or are met in a limited way.

Academics

The instructors viewed the issue of flexibility and accessibility of PHE offered in their College within the context of the specific courses they teach. The core courses in these programmes are usually oriented towards practice. Theoretical presentations are always followed by seminars and practicum sessions during which the students can acquire practical skills related to the theoretical topics to which they were introduced. The small number of students in each group assures an individual approach during the theoretical, seminar, and practical sessions. The relation of theory to practice is approximately 1:3.

As one of the major barriers for the students in their learning, the instructors identify the high academic level of the courses and especially the amount of information presented and required to be learned, retained, and applied in practice. However, the instructors do not relate students' attrition to this barrier; rather, they view that attrition is to a higher degree related to the specifics of the skills that need to be acquired which encompass both academic and practical/tactile skills. Finally, similarly to the administrators, the instructors pointed out that the strict attendance policy of the College makes the programmes less flexible; they also emphasized that in their opinion this policy is a key factor for assuring high-quality education in their fields.

The college instructors do not view the implementation of technology into the learning process as an instrumental approach that might support the students to overcome the barriers related to content acquisition and scheduling. Only one of the instructors mentioned that she might consider the inclusion of Web 2.0 based-teaching and learning practices into her teaching of theory but she also pointed out that she needs more training and the support of the college administration.

Students

The views of the students on the barriers were very similar to the ones shared by the administration and instructors. All interviewed students stated that the compulsory attendance makes the programmes less flexible which is definitely a barrier for some of the students because it prevents them from holding jobs and/or taking care of their families. Another barrier which they pointed out was the financial barrier when tuition payments are concerned. Further, the students from the non-regulated programs shared that the flexibility in terms of attendance of their programs are slightly better than the flexibility in the regulated programs; however, they also pointed out the strict attendance policies as a barrier. Although the students saw the high level face-to-face engagement in their studies as an obstacle, they shared their belief that the nature of their studies requires such compulsory attendance and this is the responsibility of each student to arrange their personal and financial affairs in a way that would allow meeting this requirement.

In the course of the interview, all three groups of participants expressed their keen interest in making their programs more flexible through expanding communication and collaboration with similar institutions within the country and in the European Union. However, obstacles such as lack of means to support such collaboration with other institutions as well as the language barrier, when EU collaboration is considered, were pointed out.

Overcoming the obstacles: current practices

Decision Makers

Accounting for the financial obstacles, the administration makes efforts to support students when tuition is concerned by allowing tuition to be paid in installments. No specific approaches are considered in relation with the strict attendance policy. The interviewees suggested that it is students' responsibility to find the time and means in order to successfully complete their studies. There are no systematic records of student detailed demographic profile (including family status, employment status etc.), attrition rate, and the reasons for which drop-outs are unable to complete their studies. However, according to the administrators, the drop-out rate is not high in terms of keeping the enrollment levels adequate to the requirements; therefore, they are not concerned about this issue.

Academics

As it was mentioned earlier, according to the instructors, it is the amount of information that makes the courses difficult. One of the strategies for overcoming this particular barrier is the implementation of a well-planned system for ongoing assessment that helps to prevent students from falling behind. Further, efforts are made to provide hands-on practical experiences within each course in order to support students' learning.

The instructors also pointed out that the small group size allows for individualized approach to teaching and although students are expected to have 100% attendance if a student misses a class, the instructor may schedule an individual make up session and consultations. Finally, the instructors recognized that the fact that the groups are heterogeneous in terms of age and life experience is beneficial for students' learning: the younger students model

proactive behavior, while older and more mature learners model persistency and systematic approach to their studies.

Technology as part of the learning process

Administrators and academics

At the College, there are no structured and formally organized online learning activities. In order to understand better this lack of use of online learning, we asked the interviewees about their awareness of specific learning and teaching approaches which incorporate Web 2.0 technologies. During the interview, only one of the instructors shared that she participated in a short e-learning training session organized by another university, the rest of the interviewees, both at administrative and faculty level, did not mention any training. Furthermore, except for this instructor, all participants from the administrative and instructors' groups had only general information about the nature of Web 2.0 technologies, they did not distinctly separate them from Web 1.0 technologies and did not envision the use of information technologies in PHE settings. Possibly, this limited awareness of the issues related to the inclusion of Web 2.0 technologies in PHE shaped the participants' opinion of the instructional value of these technologies in the context of the learning process.

The administration of the College shared a strong belief that for the knowledge and skills that need to be acquired during the course of study in the college, the online form of education is not appropriate. All interviewed instructors also pointed out that the specifics of the skills to be acquired by their students require exclusively face-to-face instruction. Only the instructor, who had training in e-learning, viewed the technology as a resource for additional information and effective communication between the students and the instructor outside of class. Her students actually use Skype to collaboratively work on assignments and get ready for exams. This instructor herself created a Facebook profile for the programme to inform the community and her stu-

dents about novelties and events in the field. This instructor also believes that if the necessary means and organization are in place, some of the theoretical topics could be presented online which would save time and provide more flexibility to the programs. This would also allow expanding the hands-on parts of the courses.

The other instructors view that technologies might be instrumental in providing more flexible access to learning materials, they shared that they use multimedia for lecture presentations and mobile phones for easier communication (they were referring to regular calls via mobile phones). They added that access to high-speed Internet connection would allow easy access to online video materials which would provide students with additional opportunities to view important techniques and analyze their elements. Currently they use video recordings of various formats (from VCR to U-tube clips) for such purposes. However, when talking about multimedia content, they perceived themselves as users of multimedia materials that are already produced, rather than being active members of community of PH educators who share materials with other colleagues and learners outside of their class. This might be related to their perception of the role of technology in PHE as well as to the lower level of their computer skills: none of them thought of her as being technologically savvy. It was interesting that two of the instructors were reluctant even to discuss the place of technologies for learning and in their teaching practice.

Considering the above, it is not surprising that only the instructor who had some training shared her support for collaborative learning with technology, she has not only implemented some approaches to promote collaborative learning through technology (Facebook and Skype) but also is looking forward to participate in training that would reveal additional opportunities for such learning. No clear opinion was expressed by the other instructors when

they were asked about their views on collaborative learning through technology.

Students

Similarly to the administrators and instructors, the students' understanding of specifics of Web 2.0 technologies was limited. They did not demonstrate familiarity with specific applications exemplifying the use of Web 2.0 technologies for learning in their field. They also viewed the principles of Medicine 2.0, when they were mentioned by us during the interview, as something that does not apply to their future professional reality. When talking about including technologies in their learning, they used the term "technology" in a board sense without actually referring specifically to Web 2.0 but rather embracing both Web 1.0 and 2.0 technologies.

It is interesting to note that even the students who were engaged in collaborative learning interactions online did not discuss the role of technology for collaborative learning. Furthermore, the students from one of the regulated programmes expressed their negative attitudes towards learning online. One of the students stated that because computers influence quite aggressively almost every aspect of our life, it might be appropriate to provide a "computer free environment" in the classrooms.

The students from the non-regulated programmes viewed technology as means to support their learning of theory through online provision of learning materials and online submission of assignments; they believe that such use of technology would help overcoming the attendance barrier. In addition, according to the students, technologies provide opportunities to learn through multimedia – the recorded performance of specific techniques allows multiple reviews, the use of slow motion and stop frame, features that they find to be very important considering the nature of the professional skills they are acquiring.

Discussion

Based on the outcomes of the presented interview analysis, we could conclude that the view of the PHE as education which requires full time face-to-face presence is shaped by the government regulations and adopted by the main actors in the learning process in this college: the college administration, the academics, and the students. Moreover, their limited understanding of the specifics and the possibilities of Web 2.0 technologies to support self-directed, active and flexible learning, student-centered instruction, and acquisition of professional practices compatible with the emerging expectations of Medicine 2.0 prevents them from considering the implementation of these technologies. Along with the stated above, comes the lack of specific data that would further inform the decision making when strategies for overcoming the flexibility and accessibility barriers of the college programs are considered.

These conclusions lead us to suggest specific strategic approaches as being instrumental for supporting Web 2.0 inclusion into the learning process as means for overcoming existing obstacles, increasing flexibility, and providing effective PHE which would meet the demands of the immerging Web 2.0 and Medicine 2.0 communities:

I. Raising the awareness of the administration and instructors about existing teaching approaches and practices in the field of PHE supported with Web 2.0 technologies. These can include introducing them to forums for online communication and collaboration within and among communities of practice in public health. Examples of such forums could be health related blogs, wikis, social networks and the new models of Personal Health Records (Eysenbach, 2008); these forums could involve public health care professionals and patients and be part of PHE and PH practice. In addition, they can explore the existing practices involving the use of serious games and virtual learning realities and simulations in PHE. These uses of Web 2.0 technologies can help to overcome the obstacles identified in the interviews: (a) they pro-

vide basis for more flexible curricula and schedules without jeopardizing the quality of education, (b) they can provide opportunities to a greater access to other communities of practice in the field, and (c) they can support learning of highly theoretical and technical aspects through supporting the information presentation and organization and through providing meaningful and smooth transition between theory and practice.

II. Following the initial acquaintance with Web 2.0 technologies, the faculty members can participate in professional training programs that would further develop their computer and pedagogical skills when the use of Web 2.0 technologies is considered. The aim of this training will be to support the inclusion of these technologies as an integral part of the learning process with the aim to train PH professionals whose skills will meet the demands of the modern society.

III. With the consideration that there are very few if any PHE oriented Web 2.0 applications and environments in Bulgarian language, another goal of such training will be to guide professionals towards acquiring skills which will allow them to get involved in the pedagogical design of Web 2.0 applications and learning environments for their students in Bulgarian.

IV. The faculty members who start using Web 2.0 technologies in their teaching should support their students in the acquisition of the necessary computer and professional skills that would assure their success in Web 2.0 learning and professional environments.

V. Considering the expressed interest towards establishing connections with other PHE institutions in the country and especially in the EU, the administrators should seek opportunities for finding such partners and promote the Web 2.0 technologies as a tool for communication and collaboration; this would be a low-cost solution that would at the same time provide opportunities for establishing or entering flexible professional networks.

VI. The administrators should plan strategies for overcoming possible language barriers in the communication with international partners through establishing language training programs for their students and faculty members.

VII. When the flexibility and accessibility of education within the college is concerned, it is essential for the college administration to conduct a systematic study of students' detailed demographic profile, attrition rate, and the reasons leading to student drop-out. This is especially important because of the changing demographics of student population with students of various ages entering the college programmes. Based on the outcomes, strategies for meeting the needs of students who are more likely to fail to complete their studies should be planned; in this context, the role of the Web 2.0 technologies, among the other measures for improving the accessibility of education, should be considered.

VIII. Taking into account the growing role of informal education which is also marked by the presence and use of Web 2.0 technologies, it is also viewed as instrumental for the key actors in PHE in Bulgaria to consider a system for acknowledging knowledge and experience acquired outside of the specific educational institution. Such system could support the creation of fast-track programs; their accreditation can be supported by the already existing and clearly stated professional descriptions including skills, knowledge, and competencies.

NOTES

1. http://ec.europa.eu/education/policies/educ/bologna/bologna.pdf
2. http://www.euro.who.int/__data/assets/pdf_file/0006/80592/E90023.pdf

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ENVIRONMENTAL PRACTICES AMONG THE USA AND RUSSIAN STUDENTS: CROSS CULTURAL ANALYSIS

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Abstract. This study provides a holistic approach in the form of a case study on the Colorado State University (Fort Collins, the USA) and Kazan Federal University (Kazan, Russia) students' environmental behavior practices. It discusses definitions of environmentally sound behaviors; examines some environmental behavior theories, offers an empirical data on the different types of environmentally sound behaviors, environmental lifestyle, environmental decision making, and environmental activism of the CSU and KSU students. In addition, the results provide a test of the validity of the game theory approach (Nishino et al., 2007) and norm activation theory (Schwartz 1977). Key practical implications for the policy and decision makers are discussed.

Keywords: environmentally sound behaviors, environmental lifestyle, environmental decision-making, environmental activism, environmental responsibility, game theory, norm activation theory, context variables

Introduction

Students of today are the future policy and decision makers. Thus, it is crucial to study students' behavior practices towards the environment and the meanings they imply to them because they will affect the future decisions concerning the natural resources.

Furthermore, every society has its own configuration of environmental risks, environmental agents and institutions, infrastructural support. Thus, studying environmental behaviors of students in different societies could provide a fruitful opportunity to capture various alternative models and approaches of reconceptualization the environmental discourse.

A literature review demonstrated that youth environmental behavior has been research topics for several decades in Russian (Yanitsky, 1998; Haliy,[1] etc) and the USA (Meinhold & Malkus, 2005; Lee, 2008, etc). There has been substantial research compiled looking at youth and the environment (Howe et al.,, 1996; Lyons & Breakwel, 1994; Fien et al., 2002; Hausbeck et al., 1992). Compared to environmental awareness, Russian researchers pay less attention to the environmental behavior concept. Most of their work aim to analyze environmental movements (Nugaev, 1998; Yanitsky, 2002; Fomichev, 1995). The US environmental researchers are more likely to concentrate on a particular type of behavior; a remarkable number focus on recycling (Barker et al., 1994; Bratt, 1999). Few studies examine youth environmental behavior in cross-cultural perspective.

This particular study introduces a holistic comparative approach including the analysis of different types of environmentally sound behaviors of college students; environmental lifestyle, environmental decision making, and environmental activism. Furthermore, the relationship between game-theory and norm activation theory approaches and environmental behaviors are ana-

lyzed. Finally, students' incentives to perform environmentally sound activities are examined.

The study applies an interdisciplinary framework which draws on the field of Sociology, Environmental Studies, Comparative Sociology and Social psychology. From the practical point of view, the results of the study would be useful in building an efficient environmental policy of youth communities of the given regions.

The article is organized as follows. First, a literature review details previous work on the environmental behavior and lifestyle. A number of hypotheses are developed. Next, the study's methodology is outlined and the results of the research are presented. The paper concludes with recommendations for decision and policy makers.

Review of literature

Conceptualizing environmental behavior

Depending on the methodological orientation environmental behavior can be conceptualized in two main ways. In one line of research, environmental behavior defines by its impact: «the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself» (Stern, 2000, p. 408). With this in mind, some behavior patterns can cause environmental change directly (e.g., waste disposal), while others can affect environment indirectly through shaping more broad context (e.g., tax policies, international policies, etc).

In the second meaning, environmental behavior is seen as behavior that is tackled with the intention to change the environment (Stern, 2000). While the impact-oriented approach is mainly concentrates on a negative effect on the environment, the intent-oriented approach is more likely to focus on a positive change through individuals' engagement in the environmentally friendly practices. Both definitions can be incorporated in my research, but for differ-

ent purposes. The impact-oriented approach can describe behavioral patterns linked to a broader environmental context, whereas the intent-oriented approach can reveal individuals' motives behind environmentally friendly acts.

Theories of environmental behavior

Environmental scientists dedicate considerable attention for studying the rationales behind the nature of environmentally friendly and environmentally hostile behaviors (McKenzie-Mohr & Oskamp, 1995; Stern, 2000, etc).

Some of them incorporate a game theory approach (Nishino et al, 2007). From this perspective, the main factor that motivates people to act in the environmentally sound fashion is the sense of resource exhaustion. However, environmentally responsible behavior itself is not profitable; self-interested behavior that disregards environmental issues usually brings high profit or other benefits to a particular person. However, as the resource degradation increases, group solidarity to save the resources enhances because it brings harm to people's self-interest. With this in mind, I hypothesize that students, who believe that the current environmental situation is aggravating are more likely to behave in the environmentally friendly fashion than their less environmentally concerned counterparts.

Some portion of environmental research shows the importance of control over the environment. Thus, according to the self-efficacy theory, people are more likely to be engaged in the environmentally friendly behavior if they feel that their behavior would make a difference (Rice, 2006). Similar, the norm activation theory (Schwartz, 1977) postulates that environmental sound behavior activated under two circumstances: (1) people must believe that an existing environmental situation poses harm to others and (2) they must believe that their personal actions can make the difference to prevent the harm. The more people feel their behavior can change the quality of the local environment; the more active is person's efforts to participate in environmentally

friendly acts. However, even if people feel they have control over the environment but are convinced that only business or the government can provide effective solutions, they might not engage in much pro-environmental behavior. In the literature this phenomenon is also called ''faith in others.''

Thus, the following is hypothesized that students who believe that they can personally influence environmental decision making are more likely to be more environmentally friendly than those who do not.

Environmental behaviors: different approaches

A wide range of subsequent environmental behavior studies reveals a discourse towards the relationship between environmental behavior and environmental awareness.

One portion of studies illustrates that environmental behavior defines and constructs environmental attitudes (Cornelissen at al, 2008). In this light of research, scientists refer to self-perception theory. This framework reflects the idea that people develop their attitudes towards the environment from the inclusion in environmental practices. «In situations where attitudes are to be constructed on the spot, or when existing attitudes are ambiguous or weak, people may derive their attitudes towards ecological behaviors from the frequency with which they involved in them in the past» (Cornelissen at al., 2008). People estimate the frequency of the engagement in the environmentally friendly practices by the frequency they come to mind. Based on this procedure, they build judgments of how environmentally aware they are.

The other studies demonstrate that environmental attitudes predict environmental behavior[2] (Jurin, 2000). In this light, a theory of planned behavior (Ajzen & Fishbein, 1980) indicates that norms together with values and attitudes determine behavior intentions, which in term predict behavior practices.

However, being concerned about the environment does not imply that one is also willing to make personal sacrifices for the environment. In this sense, attitudes may directly influence behavior; but often they do not, because other forces are more influential. In that sense, a third group of environmental scientists stress the indirect correlation between environmental awareness and environmentally favorable behavior. People's willingness to be involved in the environmentally friendly practices is mediated by a lot of external and internal factors such as situational circumstances, individual differences, normative factors, physical setting in which people carry out specific environmental actions, etc (Stern & Dietz, 1994; Stern et al., 1995, etc).

Internal variables including environmental values (egoistic, social-altruistic, biocentric), attitudes and beliefs, and environmental knowledge exist within individuals. External variables lie outside the individual (Stern et al., 1995). There is evidence that each of these kinds of incentives can affect people's behavior under the right set of conditions.

Although situational factors are difficult to control and measure, my study embedded a scale indicating the main reasons of performing environmentally sound behaviours (ecocentric, egocentric, financial, infrastructural, cultural, ect).

Methodology

Variables

Different types of quantitative scales have been produced to study CSU and KSU students' environmental behavior practices. While some scales were incorporated from previous studies (Kim et al., 1989, etc), others were created specifically for the research project in hand.

Part 1. *Demographic Factors* referred to personal information about gender, age, ethnic origin, birth place, schooling, employment status, marriage

status, religion affiliation, family monthly income and social status. They were included as control variables.

Part 2. *Environmental lifestyle* section constitutes two blocs including environmental lifestyle and environmental activism. The environmental life-style section studies students' engagement in various environmentally friendly acts like recycling, driving less/ driving more fuel efficient cars, using less electricity, buying organic food, using energy saving light bulbs, conservation of water, etc. With the aim of adapting the questionnaire to the theoretical model proposed and analyzing the personal, behavioral, and contextual causal factors that affect people's behavior towards the environment, students are asked to name the main reason behind their engagement in these environmentally responsible behaviors. Furthermore, students are asked to think about their shopping and living habits over the last 3 years and choose whether they make major changes, minor changes or no changes to help protect the environment.

Part 3. *Environmental activism* is measured by asking students about their past experience in various types of pro-environmental actions like writing a letter of protest/signing up an environmental petition, organizing a protest on environmental issues, taking part in a protest on environmental issues, facilitating the social discussions on the environmental issues, participating in the social discussions on the environmental issues, etc. I also ask respondents whether they are belong to an environmental organization or club. Moreover, students' behavioral intention is evaluated by putting them in the imaginary situation and asking them about the pro-environmental actions they would undertake.

Part 4. *Environmental responsibility and decision making* are assessed with 5 scales. They measure beliefs about self-efficacy and personal responsibility with respect to the environment (Gallup 2001). To evaluate the ''bystander effect'' or "faith in other" (Granzin and Olson 1991), a measure of

belief about the government's/ environmental organizations' and business' role in environmental decision-making is analyzed. Moreover, the students are asked to evaluate the actions that need to be undertaken to manage environmental problems.

Sampling procedures and data collection

The empirical study involved the administration of a self-completion questionnaire to CSU and KSU students. In case of CSU students' data were collected from the middle of September to the middle of October 2009 and in case of KSU students - from the middle of September to the middle of October 2010. The researcher approached the classroom, introduced her and the study, and administered the survey to groups of students who completed them in the classroom. Students responded voluntarily and were not compensated for their participation. The total number of respondents for CSU sample was 450 students and for KSU was 650 students. The sample was representative of the actual number of students with regard to gender, college year and college affiliation.

Data analysis and findings

Descriptive statistics, *t*-tests, chi-square tests, correlations, analysis of variance (ANOVA), were conducted on the data. Descriptive statistics were provided to document the students' environmental behaviors, environmental responsibility, and environmental lifestyle. A series of *t*-tests, chi-square tests, correlations and analysis of variance (ANOVA) were used to determine whether significant differences existed within and between the groups of responses by sociodemographics. The calculations were carried out using the «Statistical Package for the Social Sciences» (SPSS 17).

Research demonstrates that both CSU and KSU students' environmental lifestyle experienced minor changes over the last 3 years; 48% of Russian

and 21% of the US students have made no changes at all. The rationale behind it could lay in the assumption that the US students' lifestyle in many respects has been already environmentally friendly, such that there was not so much need for big changes, except to sustain it. In Russian case the reason could lay in the assumption that not much new environmental infrastructure has been developed to support students' green practices.

To indicate the average number of environmentally friendly activities that students conducted over the last year and for the purpose of further statistical analysis, an index of environmentally responsible behavior was created. Thus, data shows that on average over the last one year CSU students performed five different types of environmentally responsible behaviors out of nine possible options whereas KSU students performed 3 different types of environmental behaviors.

More specifically, students were involved in the following environmental activities: cutting down energy consumption (83.6%), separation waste for recycle (74.2%), cutting down water consumption (68.7%), using the car less (59.8%), choosing an environmentally friendly way of travelling (56.9%), reduction the consumption of disposable items (56.1%), choosing locally produced products or groceries (50.9%), buying environmentally friendly products (39.9%). In general, CSU students demonstrated to be more environmentally active than KSU students: less than 3% of CSU students did not conduct any environmental activities for the past year compared to 14.5% of KSU students.

Furthermore, the research shows positive and significant correlation between the seriousness of the environmental situation and environmentally sounds behaviors. Those students who believe that the current environmental situation in all geographical levels is serous perform more environmentally sound practices than their less environmentally concerned counterparts (Table 1).

Table 1. One-way ANOVA: pro-environmental behavior by the students' perception of seriousness of the environmental situation

Variables		Environmentalindex (mean)	Significance
How serious do you think the environmental situation in the city or area where you live	Extremely serious	5.68	0.000**
	Somewhat serious	5.28	
	Not so serious	4.66	
	Not serious at all	3.24	
How serious do you think the environmental situation in the state where you live?	Extremely serious	5.73	0.000**
	Somewhat serious	5.23	
	Not so serious	4.29	
	Not serious at all	3.38	
How serious do you think the environmental situation in your country?	Extremely serious	5.68	0.000**
	Somewhat serious	4.52	
	Not so serious	3.63	
	Not serious at all	1.83	
How serious do you think the environmental situation in the world?	Extremely serious	5.41	0.000**
	Somewhat serious	4.15	
	Not so serious	3.07	
	Not serious at all	2.00	

**p < 0.01,*p > 0.05

My research is guided by a contextual theory, thus, I incorporated contextual variables aiming at studying students' environmental behavior models. Some of the contextual variables were created ad hoc based on the previous research on the subject while others were identified post hoc.

Students were asked - what was the main reason why you were engaged in the environmental activities? The results show that in both the US and Russian samples students' environmental behavior practices are mainly driven by social-altruistic values ("I do not want other people and the future generation to suffer from a bad quality of environment", "the planet, not just humans depends on our help"). While the US students are more motivated by monetary incentives and costs ("I want to save money") and habitual practices ("I got used to these activities from the childhood"), Russian students' environmental behaviors are more driven by self-egoistic values ("I do not want to suffer from a bad quality of environment"). The other stimulus which students

in both countries mentioned include: community expectations ("everybody is doing them in the place where I live"), infrastructural support ("it's very available"), social-psychological factors ("they make me feel good", "it's the right thing to do", "had a good experience with these activities in the past") and exercising political will ("things I could actually participate in").

To develop strategies to achieve sustainable lifestyle, we need to understand how people's environmental behavior can be influenced and structured. Thus, the analysis of the distribution of contextual factors among different types of environmental behavior allows us to examine the dominant incentive behind a particular kind of environmental practice and thus, to better affect it.

Research demonstrates that social-altruistic values are the main driver for all environmentally friendly behavior types, especially for reducing the consumption of disposable items. Apart from it, community expectation ("everybody is doing it the place where I live") is the more dominant driver for those students who recycle and reduce the consumption of disposable items; monetary incentives and costs ("I want to save money") are the more dominant driver for those students who cut down energy consumption and try to choose an environmentally friendly way of travelling; habitual ritual ("I got used to these activities from the childhood") is the more dominant driver for respondents who cut down their water consumption and buy environmentally friendly products marked with an environmental label, and finally self-egoistic values ("I do not want to suffer from a bad quality of environment") are the more dominant driver for students who chose locally produced products or groceries.

Students were asked about their activities to promote the environment as a social and political issue. Research illustrates that the US students are more active than Russian students. American students initiated environmentally friendly practices themselves. Thus, it is quite clear from the data that US

respondents organize a protest on environmental issues while Russian students participate in the protest. Similar, the US students wrote a letter of protest whereas Russian students signed an environmental petition, etc. were actively involved in the more direct forms of environmental engagement such as taking part in the protest on the environmental issues (9.5%) and organizing a protest on environmental issues (2,1%). Furthermore, one-fourth of the US respondents reported that they have been members of environmental groups whereas only 7% of the Russian students involved in a group or organization that works to protect the environment.

In both samples the students were more involved in the indirect forms of environmental collective actions such as participating in the social discussions on the environmental issues (41.3%), writing a letter of protest (19.8%), facilitating the social discussion on the environmental issues (9.5%). Consistent with previous research, this study suggest that the more demanding forms of participation such as taking part in boycott or demonstrations are less popular among all students.

Present research demonstrated significant differences in the environmental activism model among students with different environmental value structures. Thus, students with strong egoistic and social-altruistic environmental attitudes are more likely to be engaged in the environmental active behaviors than students with other types of values. The reason behind more active environmental engagement of the groups with egoistic and social-altruistic environmental values can be explained by their beliefs of the short-term and long-terms effects of environmental risks on themselves and the future generation. In addition, more active environmental engagement of these groups can be also a part of psychological benefits from expressing students' preferences through environmentally active behavior or enjoy the social benefits of participating with like-minded people (Lubell et al, 2001).

Moreover, students were asked whether there are enough environmentally friendly activities running in the place where they live. 70.7% CSU students and only 29% KSU students are satisfied with the number of environmentally friendly activities running in the place where they live.

Students who are not satisfied with the amount and the structure of the environmental activities were asked an open-ended question *"What particular environmental activities should be organized?"* The majority of American students demand organizing public environmental awareness campaigns while most Russian students identify the need for offering financial incentives (e.g.: tax breaks, subsidies) to industry, commerce and to citizens who protect the environment and having stricter laws to the environment.

There was also an opinion expressed that although there is sufficient number of activities running in the regions, few of them are efficient and environmentally sound by its main intent *"I think activities are in place but they are very inefficient. It's all about green washing… It seems they are to make us feel like there is environmentally friendly way of doing things when really there isn't. All talk."*

Data shows that US students saw 'people in general' (64.2%) in charge of the environment, while Russian students put emphasis here on the government officials (43.4.%).

Research demonstrates that while individuals are those agents that are responsible for taking care of the environment for the US students, environmental organizations are more efficient in this role (53.5%). Russian students give credit to government to solve environmental problems. Findings suggest that 69.3% of American students and only 25% of Russians are sure that they can personally influence environmental decision making.

This study proves H2 that students who believe that they can personally influence environmental decision making are more likely to be more envi-

ronmentally friendly (5.21) than those who do not (3.95) (Table 2). This correlation is more obvious in the US sample.

Table 2. One-way ANOVA: pro-environmental behavior by self-efficacy

"From your point of view, can you personally influence environmental decision making?"	Environ. behavior index; (means), the US sample	Environ. behavior index; (means), Russian sample	Environ. behavior index; (means), the whole sample	Significance
Yes	6.42	4.15	5.21	0.000**
No	4.97	3.78	3.95	

**p < 0.01,*p > 0.05

However, even if students feel they have control over the environment but are convinced that only business or the government can provide effective solutions, they might not be engaged in much pro-environmental behavior. Our data supports these findings: environmentally sound behaviors are less likely to occur when an individual recognizes other potential "helpers'' like government, business or environmental organizations (Table 3).

In order to build efficient environmental policy authorities should gain an understanding about the particular environmental activities that should be undertaken. The most effective way to learn what incentives can work is often to involve some people who are targets of behavioral change in actually designing the program through questionnaires. For that reason, respondents were asked the following question: **"What actions do you think are important to undertake to manage environmental problems?"**

Table 3. One-way ANOVA: Pro-environmental behavior by "faith in others"

"Who do you think is making more effort to look after the environment?", %	Environ. behavior index; (means) the US sample	Environ. behavior index; (means), Russian sample	Environ. behavior index; (means) the whole sample	Significance
Individuals/people in general	6.33	4.22	5.07	0.046*
Environmental organizations	5.97	3.76	4.87	
Government	5.12	3.98	4.00	
Business and industry	5.45	2.85	4.00	

**p < 0.01,*p > 0.05

Research shows that most of the US students put high priority on environmental education (61.9%) while most of Russian students prioritize stricter environmental law regulations (53.6%).

These findings are positively correlated with the existing data that a majority of Russians today support tough environmental regulations and spending on environmental protection. According to the national polls 77% of respondents agree that government regulation make the environment a much cleaner and safer place than it would be if businesses were left to their own devices.

Conclusions and recommendations

The following behavioral incentives can interact and affect each other to produce an efficient platform for environmentally sound practices development and maintenance.

The paper provides holistic insights, in a form of a case-study, on the CSU and KSU students' environmental behavior practices including environmental lifestyle, environmental responsibility and decision making, and environmental activism. Research presents a conceptual framework that empha-

sizes the determining roles of both attitudinal (environmental values) and contextual factors and especially of their interactions in the formation of environmentally sound behavior practices.

The research shows that the US students compared to Russians are more environmentally active; over the last year they performed 5 different types of environmentally sound behaviors out of 9 possible options while Russian students performed only 3 different types of environmentally sound behaviors. The main driver for such behaviors in both samples is social-altruistic values.

Furthermore, the US students were the agents who initiated environmentally active behaviors, for example, writing a letter of protest, facilitating the social discussion on environmental issues while Russian students favor more passive ways of taking actions including participation in the social discussions on environmental issues, signing a letter of protest.

The US students believe that individuals are the agents who should take care of the environment while Russian students believe this agent is the government. Besides, for Russian students the government is credible on solving environmental problems. Most American students are sure that they can personally influence environmental decision making while most of Russian students are not positive about it. My research revealed the validation of game theory and norm-activation theory.

Collectively, the results provide valuable insights on the different forms of environmental behaviors of Russian and American students. Historically more developed forms of democracy in the USA compared to Russia formed strong civil society institutions such as various environmental organizations network, environmental legislation and monitoring, etc. It was a ground for fostering active civic position of American students and for building confidence that they could influence environmental decision making. Most of Russian students until now do not have a will and experience in environ-

mental initiatives. In Russia an activity of individuals are regulated by the state norms and sanctions, thus collective and depersonalized decisions are dominated.

The supported hypothesis confirms the fundamental role of environmental values as the key stimulus of environmentally sound behaviors, traditionally supported in the literature, as a background variable which affects behavior domain. Along with it, the present study highlights and statistically supports the importance of analyzing of contextual variables in shaping environmental behavior.

This study highlights some key directions that should be considered by environmental policy and decision makers while promoting environmentally friendly behaviors. One of them is putting a high priority on environmental education and public awareness campaigns; cultivating greater environmental literacy through educational programs. Lack of information can be a drawback to environmental action because it is not always obvious to people how to behave environmentally friendly on their attitudes (Stern, 1999).

Making environmentally sound practices a convenient behavior by, for example, adapting necessary infrastructure (e.g. more convenient public transportation in case of CSU community) will motivate more people to actually practice it. In this case, students will be more willing to act in line with their environmental concern because the situations demand few sacrifices, rather than situations that involve major inconvenience.

Furthermore, some of the behavioral incentives suggested by students are based on reinforcement techniques. Positive reinforcement uses reward so that the person gains something valuable (e.g. money) for performing environmental constructive acts. Punishment means an unpleasant consequence occurs (e.g., a fine) as a result of undesirable behavior. Some of these reinforcement-based strategies (e.g., financial payments) have demonstrated consistent behavioral change. For example, Foxx and Hake offered people various

rewards to lower the number of miles they drove in private automobiles. The rewards led to a 20% reduction in miles driven, compared with a control group (Gardner & Stern, 1995).

The following behavioral incentives can interact and affect each other to produce an efficient platform for environmentally sound practices development and maintenance.

NOTES
1. http://www.isras.ru/files/File/Publication/Polis/Halii_4_08.pdf [In Russian]
2. http://ohioseagrant.osu.edu/_documents/publications/TB/TB-067%20Teacher%20Education%20at%20Stone%20Laboratory.pdf

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УНИВЕРСИТЕТСКАТА ИДЕЯ И ВЪЗМОЖНОСТИ ЗА НЕЙНАТА РЕАЛИЗАЦИЯ[1)]

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Abstract. The mass higher education and the mcdonaldization of higher education are social phenomena which shape the contemporary higher education in the world. The number of the students/lecturers increase, the number of the institutions of higher education increase as well. At these conditions, the very university idea, pronounced short with the sentence "education and research belong together", appears to be under threat. What is the idea of a university, what are the axioms of higher education, what is higher education for, how many are the educational tracks where the higher schools could be situated in their own interest – these are the questions which are discussed in details in the present paper.

Keywords: very university idea, axioms of higher education, educational tracks, mass higher education, mcdonaldization of higher education, marginal students & lecturers, surrogate science

Увод

На 22 май 1939 г. са започнали академичните тържества за 50-та годишнина на Софийския университет „Св. Климент Охридски". Тогава 162 гости от целия свят, представители на 81 университета, 11 други висши училища, 15 академии и 18 специализирани научни институти с присъствието си са потвърдили силната позиция на нашия Университет сред водещите европейски университети (Тошев, 2008а). По това време Университетът има 7 факултета – Историко-филологически, Физико-математически, Юридически, Медицински, Агрономо-лесовъден, Богословски и Ветеринарно-медицински, в които преподавателите са съответно: 54, 58, 84, 26, 94, 11 и 24 (общ преподавателски състав – 301), които през учебната 1938/1939 години са обучавали общо 5553 студенти, от които 1447 са жени.[2]

Нормативно дейността на Университета по това време се определя чрез Закона за народното просвещение (Славчев & Марков, 1940), който е предвидил съществуването и на други висши специални училища: Музикалната академия, Художествената академия, Търговската академия във Варна, Висшето търговско училище „Д.А. Ценов" в Свищов[3] и Свободният университет.[4]

През 1947 г.[5] системата на висшето образование в България включва нови институции: към университета „Климент Охридски" са включени нови факултети – Физико-математическият факултет е преименуван на Природо-математически, от Агрономо-лесовъдния факултет е отделен Лесовъден факултет и са добавени нови факултети – Зоотехнически и Факултет за стопански и социални науки; към специалните висши училища е добавено Висшето училище за физическа култура и спорт; появили са се нови университети: Университетът „Паисий Хилендарски" в Пловдив с два факултета (Медицински и Агрономически), Университетът „Кирил Славянобългарски" във Варна с

три факултета (Факултет за стопански и социални науки и два технически факултета – строителен и машинен); създадени са Държавната политехника в София с два факултета (строителен и машинен) и Висшето техническо училище в Русе с един машинен факултет.

Днес Държавната агенция за оценяване и акредитация[6] е легитимирала с оценки „добър“ и „много добър“ 51 институции на висшето образование в България, между които са следните университети: Аграрен университет в Пловдив (много добър), Американски университет в Благоевград (много добър), Бургаски свободен университет (добър), Варненски свободен университет „Черноризец Храбър“ (много добър), Великотърновски университет „Св.Св. Кирил и Методий“ (добър), Европейски политехнически университет в Перник, Икономически университет във Варна (много добър), Лесотехнически университет (добър), Медицински университет „Проф. д-р Параскев Иванов Стоянов“ във Варна (много добър), Медицински университет в Плевен (много добър), Медицински университет в София (много добър), Медицински университет в Пловдив (много добър), Минно-геоложки университет „Св. Иван Рилски“ (много добър), Национален военен университет „Васил Левски“ във Велико Търново (много добър), Нов български университет (добър), Пловдивски университет „Паисий Хилендарски“ (много добър), Русенски университет „Ангел Кънчев“ (много добър), Софийски университет „Св. Климент Охридски“ (много добър), Технически университет във Варна (много добър), Технически университет в Габрово (добър), Технически университет в София (много добър), Тракийски университет в Стара Загора (много добър), Университет за национално и световно стопанство (много добър), Университет за архитектура, строителство и геодезия (много добър), Университет по

библиотекознание и иформационни технологии в София, Университет за хранителни технологии в Пловдив (много добър), Университет „Проф. д-р Асен Златаров“ в Бургас (добър), Химико-технологичен и металургичен университет (много добър), Шуменски университет „Епископ Константин Преславски“ (много добър) и Югозападен университет „Неофит Рилски“ в Благоевград (много добър). Всички тези институции са в равнопоставено присъствие на една образователна писта, легитимирана чрез Съвета на ректорите на висшите училища в България.[7]

За да се прецени доколко основателно е българските висши училища да се наричат „университети“ или дори „висши училища“, този доклад анализира същността на университетската идея като се спира специално върху трите основополагащи аксиоми на висшето образование. Основното заключение ще бъде, че не е здравословно всички институции на висшето образование в България да се ситуират върху една образователна писта, така както е предвидено в действащия от 1995 г. Закон за висшето образование.[8] Още в статията се коментират дефектите в изграждането на органите на управление на българските висши училища. Накрая, накратко статията дава сведения и за една, преценявана от някои като порочна, тенденция в световното висше образование, означавана с термина „макдоналдизация на висшето образование“, получила размах в прехода от елитарно към масово висше образование.

Университетската идея и аксиомите на висшето образование

Университетите са между най-дълговечните обществени институции, получили устойчивост чрез възпроизводство на успешните си форми през вековете. Те са най-естествените места, където научните изследвания дават най-богати плодове. Затова е необходимо в тях да

бъдат представени възможно най-голям брой научни области с техните факултети; те функционират правилно, ако се намират в подходяща културна среда – така те могат да се опрат на традицията и приемствеността; те трябва да имат много студенти от различните образователни степени, защото многото млади хора, отворени за нови идеи и търсещи своя път в живота, са естественият фактор, стимулиращ научното дирене (Newman, 1889; Бояджиева, 1998).

Успешните университетски форми гарантират поне две неща: 1. Пълно съответствие между преподаване и научни изследвания – *Education and research belong together [образованието и научните изследвания взаимно си принадлежат].* На висок престиж се радват тези институции, които най-дълго и без прекъсване са следвали тази максима, защото прекъсването по някакви причини на научната традиция или насочването на научната дейност към непродуктивни, субективни, идеологически обременени посоки, даже и за не дълъг период от време, се отразява пагубно върху развитието на съответните научни области; 2. Успешни университетски форми са тези, които още с възникването си са с глобален характер – с общ език на науката (в средновековието – латински, после – френски, между двете световни войни – немски и днес – английски), разбираем и за студенти и за преподаватели, които не идват от определена географска област, район или народностна група, за които Европа, пък и светът са без граници.

Следователно висшето образование се изгражда аксиоматично (Тошев, 2008а) – то е следствие на малък брой основни положения, доказани чрез многовековната си проверка, които днес вече не могат да бъдат модифицирани или игнорирани.

Първата аксиома вече бе посочена – education and research belong together. Тази кратка фраза навярно най-добре отразява университетската идея. Ако това условие не е изпълнено, институцията,

в която се подготвят някакви специалисти по определени професии, не може да се нарече университетет, не е и висше училище и не е част на системата на висшето образование изобщо.

Тогава за какво е висшето образование [What is higher education for] – този въпрос е задаван многократно и отговорите – кратки или пространни, винаги водят до едно: по Clark Kerr (2001), известен американски университетски администратор, „Университетът е фабрика за знания" [knowledge factory]. При това университетът не е място просто за разпространение на известното знание, каквото е училището и други обществени формации – културни центрове, читалища и т.н., а мястото, където това знание са създава, за да се включи в съкровищницата на световната наука. Продуктът, „стоката", която се "произвежда" в университететите са новите научни резултати (Тошев, 2003a). Но какво е наука – една работна дефиниция би могло да звучи по следния начин (Тошев, 2011a): Науката е специфична човешка дейност, продукт и белег на човешката цивилизация, която се състои в събиране и систематизиране на факти от неживата и живата природа, човекът и обществото, създаване на методи за тяхното получаване и изграждане на теории за тяхното обяснение. Към това се добавя науката за образованието, в която се търсят оптималните пътища за усвояване на научните резултати в процеса на обучението и историята и философията на науката, която без значение дали в термините на „нормалната наука" (Kuhn, 1959), или в термините на „изследователските програми" (Lakatos, 1970), търси законите, по които се развива научното дирене и се осъществява световния научен процес. Наука е и университетската политика и управление, защото на основата на тази специфична научна област се създават и развиват оптималните организационни структури, чрез които се реализира световната наука и висше образование.

Щом основна цел на университетското образование е получаването на новите научни резултати, тогава на подготовката на нови специалисти в различните професионални направления трябва да се гледа като на важен, но **съпътстващ** резултат от дейността на висшето училище. Така присъствието на много млади хора в системата на висшето образование се оказва важно по две причини – първо, това са бъдещите специалисти в индустрията и обществения сектор и второ, тези млади хора създават стимулиращата научните изследвания среда и не позволяват в академичното тяло рутината, която идва с продължителното упражняване на научната професия, да вземе връх над креативността.

Науката се интересува само от новите научни резултати, а те трябва да бъдат публикувани. Затова съществува световната система за рефериране, индексиране и оценяване (Тошев, 2011б). *Световната система за рефериране, индексиране и оценяване* е среда за публикуване на научни трудове, които след оценяване от анонимни и независими експерти (peer review) се появяват в пълен текст в първични литературни източници (primary sources) (най-често списания, primary research journals), след което в съкратен вид (abstracts) тези публикации се представят и класифицират във вторични печатни или електронни литературни източници (secondary sources), където въпросните първични литературни източници са включени след експертна оценка по определени научни и издателски стандарти. Тази система, чиято първо ниво има почти 400 години история, а изграждането на второто ниво – системата за рефериране и индексиране (вторичните литературни източници) е започнало преди около 150 години, осигурява документиране и широка публичност на всички нови научни резултати, който изграждат тялото на науката. А второто ниво – вторичните литературни източници, има ролята на гарант, че това, което е

публикувано в първичните литературни източници, носи белезите на достоверността и може да се приеме като основа за следващи проучвания от други изследователи. Предназначението на тази сложна двустепенна система за публикуване на научните резултати е да осигури устойчивостта на световния научен процес като го предпази от непрекъснато появяващите се микронеустойчивости – смущения в отношенията между автори, редактори и рецензенти и да намали „шумът" в науката – наукообразни и вредни съчинения – компилации, спекулации и измами (Тошев, 2008а). Всички издания, вън от тази система, се преценяват като *маргинални* и публикуването в тях не се препоръчва, а използването им за научни цели не се толерира, защото при тях няма сигурни гаранции за качество и достоверност на това, което се намира в тях.

Така идва **втората аксиома** на висшето образование – *Publish or Perish [публикувай или загиваш]*, но *Publish But Yet Again Perish [публикуваш, но пак загиваш],* ако се публикува се в издания с маргинален характер.

Традицията и приемствеността формират **третата аксиома** на висшето образование. Вече бе отбелязано, че ако по някакви причини приемствеността отсъства, тогава нормалното здравословно развитие на университета се затормозява за дълъг период от време. Репутацията на един университет не зависи единствено от сградите и материалните ценности, които той притежава. Тази репутация главно определят неговите професори от миналото и настоящето с научните резултати, които им принадлежат. Именно традицията и приемствеността осигуряват спойката между поколенията в университета и възпитават на уважение към науката и нейните носители. Белег на научната общност е добронамереността в отношенията на нейните представители, което означава желание за споделяне на притежавания научен опит и

готовност за признание, оценка и похвала на това, което е направено от другите. Така третата аксиома на висшето образование осигурява интегритет и хармония в академичното тяло.

Образователните писти

Университетската идея за неотделимостта на преподаването от научните изследвания, Education and research belong together, е с някои специфични за различните висши училища качествени и количествени белези, което прави нецелесъобразно всички институции на висшето образование да бъдат ситуирани върху една образователна писта. Това е точно сегашният български случай, където единствената образователна писта, нормативно определена чрез Закона за висшето образование,[8] е приютила всички български висши училища, разглеждани като равнопоставени, въпреки различията в тяхната големина, профил, образователни цели и научна дейност. Това гъмжило от субекти с различни интереси създава напрежение между тях и отлага вземането на общите и продуктивни за цялата система решения. Заседанията на Съвета на ректорите изглежда са добра илюстрация на казаното тук.

Добрата практика изглежда е в Съединените американски щати, където висшите училища са ситуирани върху три официални и една неофициална, но достатъчно населена, образователни писти, нормативно институционализирани с необходимите атрибути, между които са и акредитационните системи за поддържане на качеството на висшето образование.

Писта на изследователските университети

Върху тази писта са ситуирани университетите, в които единството между преподаване и научна дейност се реализира в най-голяма степен. В Европа често означават тези институции като

университети от хумболтов тип или изследователски университети. Много от тези университети, между тях е и Софийския университет, са продукт на германската научна традиция. По правило официалното образование отразява интереса на обществото и затова дълг на държавата е да полага нужните грижи за неговото укрепване и развитие. Особеност на американския университет е (Gilman, 1881), че той съчетава в себе си английския колониален модел с германската изследователска традиция на XIX век, но включва и нова, специфична за него черта – идеята, че университетът трябва да бъде в служба на обществото (Altbach, 2004).

Казват, че тези университети са *пълни* университети, защото в тях са представени възможно най-голям брой научни области – често медицината и техническите специалности са между тях. Някои от тези университети имат конфедеративна структура и съдържат в състава си специализирани висши училища. Наличието на много факултети от различни научни области открива хоризонт за плодотворно сътрудничество между тях и дава възможност за елиминиране на дублиращи звена и дейности. Големите университети имат десетки хиляди студенти. По отношение на финансовите разходи, необходими за нормалното функциониране на университетската система, университетският тип образование (широкопрофилна подготовка) и пълните университети очевидно имат предимство пред тесните специалности и голямата мрежа от множество малки специализирани висши училища.

Върху тази писта университетите отделят огромни средства за научни изследвания. Бюджетите на университетите се попълват от държавните субсидии като институционалното финансиране на научната дейност в голяма степен е прехвърлено в системите на научното проектно и програмно финансиране; приходите от собствена дейност са

от значение, това, което идва от частни източници – също, а студентите, за да покажат съпричастност и отговорност в учебния процес, плащат студентски такси – в миналото символични, а сега все по-значими. Частни пълни университети в Европа няма, но в САЩ, като особено богата страна, пистата на изследователските университети е заета както от държавни институции (public universities), така и от пълни частни университети (private universities) и между последните, например, са: John Hopkins University, Massachusets Institute of Technology, Stanford University, Harvard University, Duke University.

Писта на либералното образование

Традицията на либералното образование (*artes liberales)* е от средните векове. Тя включва две части. Първата, *trivium*, обхваща граматиката, реториката и логиката. Втората част, *quadrivium,* включва аритметиката, геометрията, астрономията, музиката. Това е изкуството да се наблюдава, пресмята и измерва, да се усеща количественият аспект на нещата. Безспорна е връзката на либералното образование с научното съзидание. Великите европейски естествоизпитатели на XVIII и XIX век имат здравата основа на *artes liberales,* която включва гръцки, латински, логика, философия в допълнение към математиката, физиката, химията, естествената история и медицината. Но целта на либералното образование не е да създава учени. Целта на либералното образование не е професионалната компетентност. Целта на либералното образование е да развива свободни човешки същества, които знаят как да използват своя разум и са способни да мислят самостоятелно в своя полза. Чрез него се раждат граждани, които могат отговорно да упражняват своята политическа свобода. Чрез него се раждат личности, които могат плодотворно да планират и направляват живота си (Adler, 1951).

Само в свободните общества може да има либерално образование и гражданското образование може да бъде една негова проекция (Тошев, 2005a). То не съществува в тоталитарните режими. Затова споменът за българското либерално училище в миналото днес е напълно избледнял. Един забравен, но впечатляващ пример е създаденият от Едуард и Елизабет Хаскел „Селски народен университет в Пордим" (Bulgarian Folk School Pordim, near Plevna) (Тошев, 2001a). Съпътстващата дейност на това либерално училище е включвала издържането на една болница с 10 легла, ясли за 15 бебета, детска градина с 35-40 малки деца, възпитавани 6 часа всеки ден от учителка-педагожка, практическо земеделско-домакинско училище с 50 слушатели и още безплатни медицински услуги с лекар и сестра за околните села, безплатно електрическо осветление за Пордим от училищната електрическа централа и множество сказки, забави и посещения на видни американци, европейци и българи.

Не може да се твърди, че в съвременното либерално образование съответветствието между преподаване и научни изследвания се реализира в по-малка степен, отколкото това става на пистата на изследователските университети. Има, обаче, един съществен нюанс. Докато сътрудниците на изследователските университети публикуват резултатите от своите изследвания в по-тясно специализираната научна периодика, за да получат там по-бърза и професионално адекватна оценка, то, предвид характера на либералното образование, сътрудниците от либералната писта търсят по-широката читателска аудитория в широкопрофилните научни журнали, защото там техните публикации могат да ангажират по-широк научен и дори обществен интерес.

Тъй като личният интерес е в основата на либералното образование, държавата се ангажира с това образование в значително по-

малка степен, отколкото в случая на обществено значимото официално образование. При *простия модел* (single model), държавните институции са на пистата на официалното образование, а частните висши училища с по-скромни финансови възможности са на пистата на либералното образование. За малки и бедни държави този модел изглежда целесъобразен. За големите и богатите държави има място *смесеният модел* (mixed model), което означава, че на пистата на официалното образование има и частни формации, а в изследователските университети могат да съществуват като структурна част колежи на либералното образование.

Най-често либералните висши училища са малки и със скромни финансови възможности. Това, обаче, не се отразява съществено върху качеството на преподаването и научните изследвания, провеждани в тях, защото съществуват организационни форми на сътрудничество, което се отнася главно до компютърните пресмятания, информационните и комунакиционните технологии с достъп до световните научни бази данни, обединяването и автоматизацията на научните библиотеки, координацията в административния мениджмънт.

Пистата на обществените колежи

Тази образователна писта е напълно непозната в България. Върху нея се намират американските обществени колежи (community colleges). Гъстата мрежа от тези колежи реализира в голяма степен американската идея за висше образование в полза на обществото (Cohen, 2003). За този тип висше образование университетската идея за единство на преподаване и научни изследвания остава в сила, но се реализира в значително по-малка степен в сравнение с онова, което правят висшите училища, намиращи са на посочените по-горе две други образователни писти. Някои от тези колежи имат вековна история, други са нови,

пръснати са навсякъде в страната, броят им е 1173, а броят на студентите в тях надхвърля 10 млн. Средната възраст на студентите в обществените колежи е 29 години, годишните учебни такси възлизат средно на 1500 $, но издръжката на тези висши училища не разчита главно на този източник (23 %), а се поема най-вече от държавата (42 %) и по-малко от локални или други източници.

Обществените колежи са двугодишни и дават непознатата у нас образователно-квалификационна степен „Associate of Art" и „Associate of Science". Тези колежи предлагат голям брой учебни програми в най-различни области: земеделие, горско стопанство, паркостроителство, икономика и счетоводство, компютърни технологии, кулинарство, туризъм, социално дело, подготовка на служители в полицията, противопожарните и общинските служби, образованието (помощник учители), здравни грижи, грижи за болни и възрастни, библиотекари, дизайн и мода, търговия, техника и технологии. Така тези специалисти са гръбнакът на средните изпълнителски кадри в индустрията и обществения сектор в САЩ. Тяхното преимущество пред специалистите от професионалното средно образование е, че са имали в краткото си следване допир до носителите и ценностите на академизма, което оставя трайна следа в по-нататъшния им живот и професионална кариера.

Обикновено обществените колежи са с малък брой студенти, примерно 150, но с добро техническо оборудване и достъп до библиотечните и научните бази данни, което се улеснява от членството на тези формации в American Association of Community Colleges. Тези малки научни оазиси в селските и отдалечените райони на Америка имат и благотворно културно влияние в тяхната околност – често те подпомагат издаването на местни вестници и списания или спонсорират театрални постановки, оркестри и спортни прояви.

България заличи тънката ниша на своето професионално висше образование, което осигуряваше специалисти с образователно-квалификационна степен „специалист", заменяйки неудачно тази степен с „професионален бакалавър". Вместо това България можеше да развие своето професионално висше образование на основата на съществуващите по-рано институции на полувисшето образование в тясно сътрудничество с университетите и по примера на американските обществени колежи. Има бързо развиващи се големи държави, които проявяват интерес към такъв тип висше образование (Lee & Young, 2003), а други държави, например Финландия (Tulkki, 2001), реформираха и развиха своето краткосрочно професионално висше образование, насочвайки го главно към информационните и комуникационните технологии като за кратък период от време постигнаха забележителни успехи.

Създаването на институции на краткосрочното висше образование в страната, освен с положителните регионални културно-стопански и демографски ефекти, което е особено важно за бедните и обезлюдените райони на България, може да се окаже и добра алтернатива на дистанционното висше образование. След кореспондентското обучение, учебните курсове по радиото и телевизията и мултимедийните обучителни програми, днес дистанционното обучение е в четвъртата си фаза – online/virtual interactive education, което изисква значителен материален и човешки ресурс и масова къмпютърна грамотност на населението. Тези условия в България още не са налице, така че структури, подобни на американските обществени колежи, за които в страната очевидно има ресурс и желание за развитие, могат да предложат по-добрата алтернатива (Тошев, 2004).

Четвъртата писта

Тази писта е неофициална. На нея се намират т.н. „diploma mills" [мелници за дипломи]. Това са формации или групи, които предлагат дипломи за различните образователни степени срещу заплащане на определена такса според желанието и личния жизнен опит на кандидата без да се провежда учебен процес. Тези групировки имат агресивна политика в реализацията на целите си и силно присъствие в Интернет. В Америка за да намерят клиенти, тези формации често използват имена, които звучат авторитетно, а напоследък се опитват да се легитимират като се позовават на несъществуващи или създадени от тях акредитационни агенции и съвети.

Очевидно такава писта има и в България и на нея се намират повече от дузина формации с имена на университети или академии, уж или действителни филиали за дистанционно обучение на висши училища вън от страната и най-често от Русия. По правило българските структури са узаконени по Търговския закон, който позволява създаването на звена за образователни услуги, но не допуска издаването на дипломи за образователно-квалификационни степени. Дълг на държавата е да защити населението си от тази мошеническа дейност, което още не се случило в нужната степен.

Организационен модел на българските висши училища

С присъединяванато си към Болонската декларация от 1999 г. и нейната разширена версия от 2000 г. (Тошев, 2001б) България пое ангажимент да реформира висшето си образование като се откаже от модела на тесните специализации и квалификации, въведен след Втората световна война в съветския му вариант, и да организира висшето си образование в три цикъла, водещи до образователно-квалификационните степени „бакалавър" и „магистър" и образователната и научна степен

„доктор", като за първия цикъл използва модела на широкопрофилната подготовка от университетски тип (Тошев, 2003б).

Миналото винаги остава трудно заличим белег в настоящето и затова не е излишно да се посочат белезите на съветския образователно-научен модел: 1. Тесни специализации и квалификации, по възможност „по-близки до живота" за подготовка на кадри за ускореното стопанско и обществено развитие на страната; 2. Разделяне на преподаването от научните изследвания като с годините се утвърди впечатлението, че научните изследвания във висшето образование са допълнителна и незадължителна дейност („плащат ни за преподаване, а не за изследвания"), за да стигне до убеждението, че с адаптиране на чужди образователни програми и създаване на „университети" с пътуващи преподаватели, работещи другаде или пенсионери, може да има успешен учебен процес. Това усещане има своите обществени проекции и днес – публиката и медиите наричат хората във висшите училища „преподаватели", но никога не ги наричат „учени".

Висшето училище, създадено по съветския образователно-научен модел, има 5 основни характеристики, които ще бъдат посочени тук, за да се види в каква степен днес те са преодолени (Димитров & Тошев, 2001): 1. Голям брой постоянни щатове, които в крайна сметка блокират развитието на образователните институции; 2. Голям бюрократичен чиновнически апарат, който най-често не е в помощ на академичния и студентския състав; 3. Репресивни звена, които не допускат във висшите училища лица, за които има съмнения в лоялността им спрямо комунистическия режим; 4. Псевдонаучни звена, проповядващи комунистическата идеология и религиозния атеизъм; 5. Звена от „сюнгеров"тип, погълнили големи материални и човешки ресурси, създадени около лица във властта или близки до нея.

Големите постоянни щатове и днес са бич за българското висше образование. Все още липсва волята да се въведат временните научни позиции в университетите, заемани от лица с докторски степени за определени периоди от време. Заеманите временни научни позиции на различни места са важни стъпки в кариерното развитие на изследователите, които в тези периоди се стараят да се изявят по най-добрия начин и затова хората с временни позиции в университетите са гръбнакът на висшето образование в модерните държави. В началния вариант на Закона за висшето образование от 1995 г. бе направен плах и в крайна сметка несполучлив опит от въвеждане на временни назначения в българските висши училища.

Организационният модел, по който сега се изграждат институциите на висшето образование в България, може да бъде подложен на многопосочна критика. Сега тук ше бъдат направани само няколко бележки върху целесъобразността на изборите „отдолу-нагоре" на университетските ръководни тела. Сегашната практика, нормативно определена чрез Закона за висшето образование, е известна всекиму. За сравнение ще бъде описан начинът, по който в миналото е избиран ректора на Софийския университет – процедурите са представени в Правилника на Университета[9)] и са прилагани в продължение на десетилетия без да възникнат съмнения в тяхната целесъобразност или ефикасност. Тези процедури в голяма степен следват германската научна традиция и днес в Германия много от университетите избират ръководните си тела по такъв или подобен начин.

Отговорностите по управлението на университета са разделят между три лица, които са в състояние на частична субординация – Ректорът, редовен професор[10)], който се избира от професорите и редовните доценти на всички факултети с тайно гласуване за срок от една година; следващата година той ще остане в управлението на

университета като проректор, Началникът на канцеларията (университеси секретар), който се назначава от Министъра на народното просвещение и Началникът на бюджетната контрола (университетски квестор), който се назначава от Министъра на финансите. Академичният съвет се състои от следните лица: ректор и проректор, декани и продекани и по двама преподаватели (редовни и извънредни професори и редовни доценти от всеки факултет, освен онези, от чиито среди са ректора и проректора – тези факултети ще имат един представител в Академичния съвет). Така всички факултети на Университета са оказват равнопоставени. Изборът на ректор става всяка година в първата половина на м. юни. Новият ректор заема длъжността си 10 дни преди началото на учебната година. В деня на Св. Климент, патронният празник на Университета, става тържественото представяне на новия ректор. Старият ректор, който ще бъде вече проректор, представя отчет за изминалата учебна година, а новият ректор държи академично слово.

При този модел на ректора се гледа като на лице на университета – той с научните си постижения трябва да е известен на световната научна общност, така че чрез своето име той трябва да привнася престиж към научния и обществен образ на университета. Затова извънреден професор или редовен доцент не би могло да стане ректор на университета. Научните изследвания и получаването на оригинални научни резултати са основното академично задължение. Продължителната административна дейност крие рисковете на професионалната деквалификация и затова срокът на ректорството е само 2 години – една като ректор и следващата година – като проректор. Това условие влиза в противоречие с текущата практика, когато един ректор заема длъжността често цели 8 години, като в тези среди има

изразено желание за увеличаване на възможните мандати или отпадане на мандатността изобщо.

Днес ректорите се избират с тайно гласуване от Общите събрания на университетите, които в големите университети включват стотици разнородни по университеския си статут представители. Смята се, че такава процедура на изборност – колективите да избират своите ръководители, е достижение на демокрацията за академичните среди. Всъщност зад демократичната фразеология и обвивка прозира популизмът (Gelber, 2011), който цели запазване на статуквото в интерес на мнозинството, но което с времето води до забавяне или спиране на развитието на академичната институция.

Макдоналдизация на висшето образование

Макдоналдизацята на висшето образование е болест на съвременното общество с неясна прогноза.Това световно явление бързо намери своето проявление у нас, което изисква неговият по-внимателен преглед, частично вече даден по-рано (Тошев, 2005б).

По Ritzer (1993) макдоналдизацията засяга всички обществени сектори и има четири основни белези: *ефективност, предсказуемост, изчислимост и контрол*. Наистина изглежда разумно всяка човешка дейност да се подчинява на такива правила, но за съжаление не може да се установи дозата, в която те трябва да се прилагат. Например, ефективност на учебния процес означава намиране на оптималния път за постигане на търсения резултат и науката за образованието предлага голям брой инструменти за реализация на тази цел. Макдоналдизацията, обаче, е с „ненаситен апетит" (Slater, 1999) и скоро след прилагането на нейните подходи отрицателните последствия стават факт. Често усилията да се повиши ефективността водят до нейното понижаване,

или, както е отбелязано още от Weber (1991), онова, което е било въведено, за да бъде рационално, всъщност се оказва ирационално.

Макдоналдизация във висшето образование означава, че образованието е стока, има образователен пазар и, следователно, прилагането на пазарните принципи в образователните системи е допустимо. До такива твърдения се достига на основата на формалното сходство, което може да се забележи между университетските и стопанските структури. Прилагането на пазарните правила в системата на образованието, обаче, е неправомерно и аргументите към това съждение са обсъждани подробно в специализираната литература (Birnbaum, 2000). Ето някои от съществените различия между институциите на образованието и бизнеса. „И двата типа формации предлагат стоки и услуги, създават ресурси и са средища на висока компетентност. Университетът, обаче, не е фирма. Неговата основна дейност не носи печалба, откъдето идва възможността да не търси максимална ефективност в реализацията на своята дейност. Университетите действат в един „пазар“, където обикновено хората не знаят какво „купуват“ и повечето от тях ще могат да оценят стойността на полученото едва след години. И „консуматорите“ и „мениджърите“ тук се ръководят в по-голяма степен от идеални подбуди, отколкото от желанието за печалба. Всички „консуматори“ получават някаква финансова покрепа от държавата и техните близки и всичко се „продава“ на по-ниска цена от реалната стойност на тези „продукти“. Академичната колегия често е средище на вътрешни противоречия и личностни конфликти, а части от академичните институции обикновено имат различни интереси, което създава напрежение между тях. Чувството на единоначалие е чуждо на университетските преподаватели. По правило дейността на академичните ръководства се оспорва и критикува. Всяка фирма,

поставена при такива условия, бързо ще преустанови своята дейност. Университетът обаче не е фирма.“

Наистина е пагубно, когато обучаващите се започват да се държат като клиенти, които искат да получат някакъв продукт, израз на който е съответната диплома, и това трябва да стане с най-малко усилия, бързо, с най-малко вложени средства и без никакви лични ангажименти, защото те били вече платили за това. Но, според Panton (2001) „резултатът от макдоналдизацията на висшето образование е разочарование от образованието с неговите сменящи се консуматори, които е трудно да бъдат привлечени и още по-трудно да бъдат задържани.“

Образованието не е стока. На 18 и 19 май 2001 г. в Прага се проведе среща на европейските министри, отговарящи за висшето образование и подписали Болонската декларация за създаване на общо европейско пространство (Тошев, 2001б). На тази среща представителите на студентските съюзи в Европа се обявиха против макдоналдизацията на висшето образование чрез категоричните твърдения: *„Студентът не е клиент; Образованието не е пазар; Университетът не е супермаркет“*. Образованието, поне за институциите, които се намират на първата образователна писта, е *публично благо,* което ангажира освен личния и обществения интерес, и затова задължение на държавата, като изразител и гарант на обществения интерес, е да упражнява контрол и да създава условия за неговото хармонично развитие. Образованието е връзка между обучавани и обучаващи, чрез която новите поколения имат възможността да осмислят опита на предходните поколения, с което се създават условия за получаване на нови резултати, които маркират пътя на човечеството в бъдещето.

Така отново се достига до представата за университета като един инструмент за трансмисия на известното знание и създаване на ново

знание. Институции, изградени при строго съблюдаване на университетската идея за единство между преподаване и научни изследвания, рядко осигуряват хоризонт за макдоналдизационните идеи. В страни, в които научният сектор не е развит в достатъчна степен или при страни в преход със стопански хаос и правен дефицит, където образователните цели не са избистрени с нужната пълнота, части от академичната общност лесно приемат заблудите на макдоналдизацията на висшето образование. Най-ревностните привърженици на пазарните подходи в образованието обикновено са хора с академични степени, но с незначителни собствени научни резултати, които в условията на масовизацията на висшето образование са получили убеждението, че образованието би могло да стане доходоносен бизнес.

Масовизацията на висшето образование е световно явление, което не подмина България. Докато, например през 1962 г., нашата страна е имала 85 000 студенти, сега, за учебната 2010/2011 година, България има[11] 285 300 студенти, разпределени по специалности по особено неблагоприятен за бъдещето развитие на страната начин: за „бакалавър" и „магистър" най-много са студентите, които следват стопански науки и администрация (22,3 %), следват по брой студентите от техническите науки и професии (14 %) и науките за обществото и човешкото поведение (11,8 %). Несъмнено това са важни области, но с обслужващ характер – просперитетът на нацията в бъдеще, научните пробиви и иновационните решения са във връзка със студентите с аналитични нагласи на мисълта, в които креативната поведенческа функция доминира над репродуктивните възможности. Това са студентите, които търсят бъдещото си кариерно развитие в областта на математиката и природните науки (физика, химия и науките за Земята). Броят на тези студенти е драматично малък – 0,3 % за математика и статистика и 0,5 % за природните науки.

Проблемите на масовизацията на висшето образование са извън обсега на настоящата статия. Ако изобщо това ново развитие на висшето образование се споменава тук, то е, за да се каже, че масовизацията на този тип образование осигурява питателната среда, в която лесно избуяват бурените на макдоналдизацията на висшето образование.

Все пак в допълнение две общи бележки за вече очертаващи се последствия от масовизацията на висшето внимание заслужават внимание. Готови сме да приемем, че масовизацията на висшето образование е явление с положителен знак, защото по-широкият достъп до университетите е израз на демократизацията на обществото. Несъмнено това е вярно, без да е ново. Още през петдесетте години на XX век широкият достъп на всеки американец до висше образование е ключов елемент в образователната политика на тогавашния президент Труман и това е довело, например, до бума в развитието на обществените колежи и нормативното осигуряване на третата образователна писта, на която те се намират. Днес този принцип се пренася и към по-долните образователни нива – затова американският закон за средно образование се казва „No Child Left Behind."[12]

Отрицателните ефекти, които поражда масовизацията на висшето образование са свързани с факта, че в системата на висшето образование постъпват хора, които при нормални условия нямат качествата да бъдат там. Това са студенти, но и преподаватели, защото масовизацията поражда и експанзия и нарастване броя на образователните институции. Тогава „фазите" на студентите и преподавателите, монолитни преди, сега се разпадат на фаза на студентите и фаза на преподавателите и фаза на маргиналните студенти (Ghory & Sinclair, 1987) и фаза на маргиналните преподаватели. При разпадни процеси в средното образование броят на маргиналните студенти ще расте. Именно в допирната плоскост между фазата на маргиналните студенти и фазата на

маргиналните преподаватели избуява уродливото явление на корупцията на висшето образование (Тошев, 2011в). Вторият особено вреден ефект е, че с масовизацията на висшето образование се увеличава полето на сурогатната наука за сметка на полето на истинската наука. Това става поради включването в научния сектор на хора, които нито имат подготовката, нито имат вътрешната дълбока мотивация да бъдат там. Именно те формират фазата на маргиналните преподаватели. Белег на науката е широката публичност на това, което е в нея – това е наука насочена „навън". Сурогатната наука е насочена „навътре" – авторите в нея не търсят широката публичност на това, което публикуват и за да избегнат оценката на анонимни и независими експерти публикуват в маргиналните литературни източници (Тошев, 2011а).

С масовизацията на висшето образование се засилва процесът на множене на висшите училища. Обратният процес се означава като *амалгамиране на институциите на висшето образование* (Chen, 2002; Lang, 2002). Сливане на висши училища се предприема, когато се осъзнае, че това ще повиши тяхната ефективност след ликвидиране на дублиращи звена и дейности. У нас вече има усещане, че броят на българските институции на висшето образование е твърде голям (има, обаче, държави с по-малко население от нашата страна, но с повече университети – например в Монголия с 2,7 млн население има 178 университети и колежи). Всъщност проблемът не е в броя на висшите училища в България, а в това дали тези висши училища имат реален научен капацитет, за да реализират в нужната степен университетската идея за единство между преподаване и научни изследвания.

Заключение

Подробният преглед на съвременното състояние на системата на висшето образование в България не е между целите на тази статия. Тук

няма градиране на основните проблеми, пред които са изправени българските университети, нито се предлагат решения за преодоляване на възникващите затруднения и неудачи.

Основната цел на тази статия е по-скромна. Чрез нея се очаква академичната колегия и отговорните фактори в българското образование да бъдат убедени, че съществуващата мрежа на българските висши училища не се вписва добре в европейското и световното образователно и научно пространство. В същото време България със своята учебна и научна традиция и научните постижения на своите учени в миналото и сега заслужава достойно място в обшото европейско образователно и научно пространство. За да се случи това е нужна реформа, вече неотложна, но не хаотична и имитационна, а реформа, която има зад себе си теория с ясни ориентири, които очертават нейната концептуална рамка, осъзната и приета от всеки, който е ангажиран с тази проблематика.

Всъжност основните ориентири на реформата, по които трябва да се постигне пълно съгласие са само два:

Категорична замяна на модела на тесните специализациии квалификации с модела на широкопрофилната подготовка от университетски тип. Това означава, че България трябва да изпълни поетите задължения по Болонската декларация за изграждане на общото европейско образователно пространство. Освобождаването на бакалавърската степен от тесните специализации и прехвърлянето им във втория и третия цикъл на висшето образование ще открие възможност за намаляване на срока на обучение в тази базисна за висшето образование образователно-квалификационна степен. Така ще спре засилващото се, особено в последните години, умножаване на специалностите на бакалавърско ниво. В организационен план това може

да се случи при намаляване на постоянните щатове във висшите училища и въвеждане на временните научни позиции там.

Категорично приемане на университетската идея за единство на преподаване и научни изследвания. Тогава съществуват механизми и лостове, чрез които държавата може да постигне оптимизиране на университетската мрежа в България в интерес на институциите с доказан и признат в света научен капацитет.

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